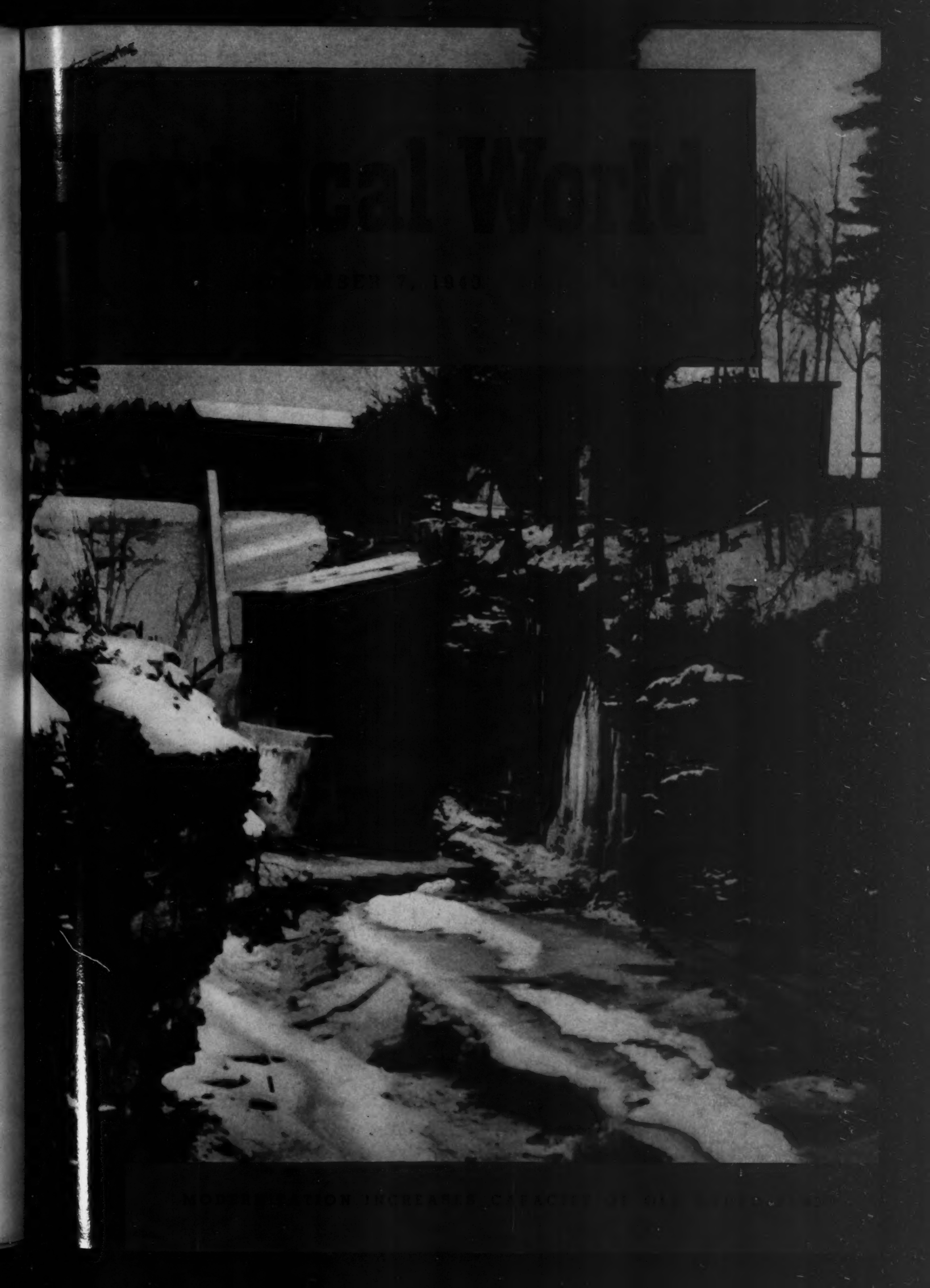

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September 7, 1940

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Utilities Ready for the Draft

The "Selective Training and Service Act of 1940" was passed by the United States Senate on August 28. Probably by the time this comment reaches the reader the House of Representatives and the President will have acted and this legislation, or its equivalent in intent and purpose, will have become the law of the land.

If the law, as finally enacted, contains the same provision as to age limits, 21 to 31 years, as in the Senate bill, then there is reason to believe that its effect on operating personnel of electric utilities will perhaps be less than in some other industries.

The reason lies in the general job security which has characterized electric utility employment throughout the history of the industry. Men who get jobs with power companies usually hang on to them, are less inclined than others to quit and look for other jobs. Also, because of the nature of the business, contractions and expansions in number of employees in response to the ups and downs of general business conditions are small. It would be safe to say, just from observation, that about two-thirds of electric utility employees are above the upper age limit of the Senate bill.

It may not be assumed, however, that this casual estimate, unsupported by competent statistical study, can be construed as advice that power companies need not anticipate and make plans to handle problems of personnel arising from military service. There will be many such problems in connection with men older than those in the compulsory service group and who belong to the National Guard or hold commissions as reserve officers. And it is to be considered as well that the men who will be drafted from the utility to the military ranks will include many of those who have begun to accumulate the background of experience which is really necessary for complete competence in handling all the duties and responsibilities of their positions.

Therefore it would seem to be only elementary common sense for power companies which have not already done so to organize training programs for new employees, particularly in the plant and system operating classifications, so that completely adequate replacement may be made of men called for military service. Again from observation, the statement can be made that as regards most of the utilities serving the larger metropolitan and industrial areas training programs have been long and well established as regularly functioning parts of operating organization.

Undoubtedly the selective service law as finally passed will embody the requirement that the employer must re-employ the soldier after his period of service is ended. Generally throughout the industry this responsibility was voluntarily assumed by power companies during the last war, and in the main it was conscientiously discharged. This feature of the law will not impose any change of attitude or practice on the electric utility industry.

Confidence that the power companies can and will quickly gear themselves and their operations to the requirements of selective military service appears to be wholly justified. The nation will discover no obstructive disposition in this industry, nor need it fear any impairment of service resulting from disruptions of personnel.

Simulated Network Checks Actual System

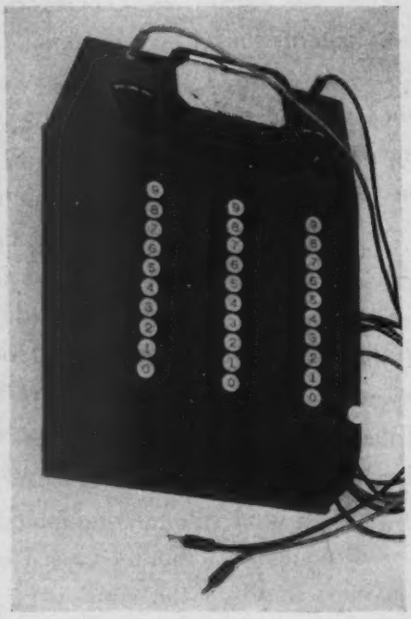
Miniature system follows changes in loading and network facilities and shows the voltage and duty on transformers, cables and network conductors under all expectable conditions of operation

C. T. NICHOLSON, Buffalo Niagara Electric Corporation

IT IS reasonably simple to use one of several familiar field methods to determine the performance and adequacy of radial distribution. But it is far less positive to try to watch the performance of a network by comparable field work. Such fairly continuous observation of the loading and load distribution of a network, however, seems desirable in view of the steady expansion of networks, the growth in air conditioning, fluorescent lighting and other loads. For this purpose a miniature calculating board has been provided. Somewhat similar to the a.c. and d.c. calculating boards used in connection with transmission networks, this d.c. board provides a basis for determining the following information about the low-voltage network in the city of Buffalo:

1. Network cable loading.
2. Network transformer loading.
3. Voltages at network transformer buses.
4. Voltages at any manhole in the network.
5. Proper arrangement of high-voltage feeder supply to the network.
6. Proper locations for additional transformer capacity.
7. Location of additional low-voltage cable capacity.
8. Effect of increases in system loads at particular points.
9. Effect on system of loss of one or more high-voltage cables serving the network.
10. Effect of differences in cable size.
11. Effect of proposed solution of customer complaints.
12. Effect of proposed methods of handling increases in loads.

If desired, this information can be obtained for any or all the large number of possible combinations of vault transformers and feeders out of service. It can be done in far less time than even the approximate methods of computation. Once the board has been set up to be a replica of the loadings, cables, feeders and transformers of the existing network conditions, readings can be taken for any point or any desired change in conditions. Use of the board has already disclosed erroneous conclusions based on previously used computation methods. By simulating fault conditions the board also serves as a means of setting the protective features for the network.



NOT AN adding machine, but a network ammeter

The indicating instrument is a d.c. millivoltmeter requiring only 0.00005 amp. for full scale deflection. Each of the three rows of keys is a ten-button radio-push-button switch. The push-buttons are used to connect appropriate resistance in series with the meter movement. The resistors are of such range and relative magnitude that when the network board cable resistance (as tabulated on the painted face of the board) is set up on the buttons the total resistance so introduced (including the instrument movement) is such as to cause 1/36 of the cable current to pass through the instrument. The scale is calibrated for 36 times the current through the instrument and also takes account of the 100,000 multiplier for the board as a whole. This scheme eliminates all computation and readings are direct.

Replica of Actual Network

A geographical replica of the actual Buffalo a.c. network in miniature, the network analyzing board is built to an electrical scale of 1/100,000. The d.c. voltage applied is normally 120 volts, but a continuously variable power supply voltage is available for special studies. The resistance branches which represent the transformers, secondary cables and loads are 100,000 times the actual impedance of these network elements and are computed assuming a constant ratio of R to X and load power factors of 90 per cent. The ammeter used to make current determinations is calibrated to read directly in amperes per phase per network transformer or per set of network cables.

Resistor units utilized to simulate network loads or transformers are high-grade cartridge units of the familiar radio-set type. A generous stock of these resistors is kept in orderly arrangement in a filing cabinet for ready substitution in or addition to the board to represent changes in loads or transformers.

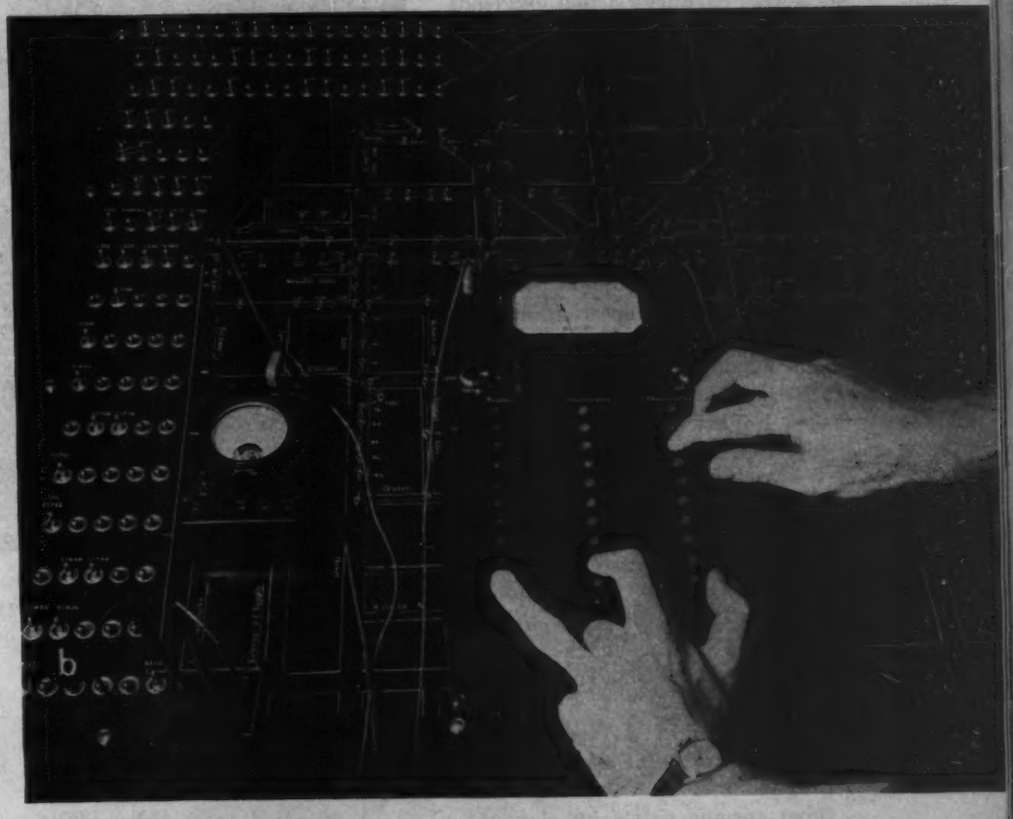
Secondary cables are represented by flexible resistors with lugs attached to studs representing splice or junction points in manholes. On the face

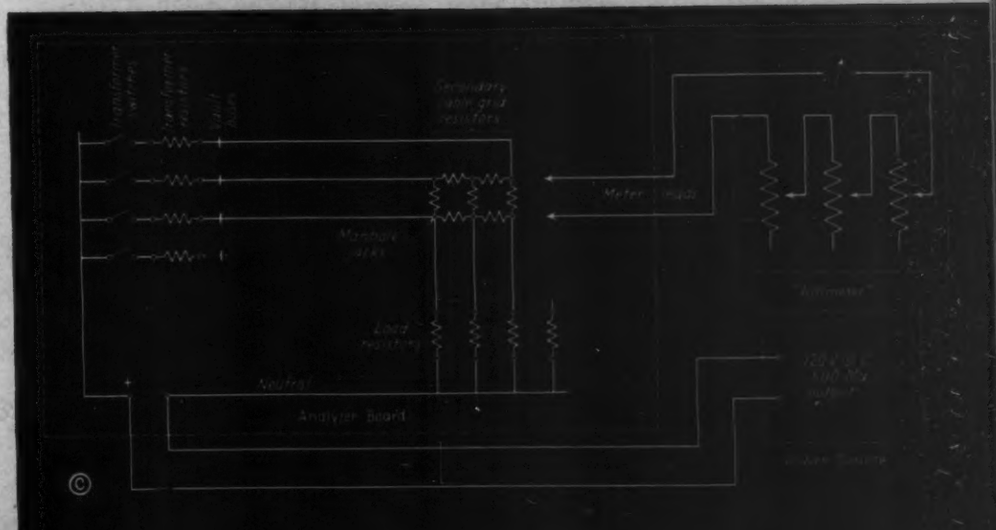
of the board these studs are recessed for insertion of the exploring terminals of the millivolt meter (ammeter).

The ammeter is unique in that it has supplementary series resistors built in so that these may be adjusted to shunt through the ammeter approximately 3 per cent of whatever current is flowing through a branch, load or transformer. Because of the small currents involved the instrument has to be a millivoltmeter drawing only 0.00005 amp. for full scale deflection.

For application on the network board the loadings are taken as the demand values set up for billing purposes or inferred from the kilowatt-hour consumption month to month.

One favorable factor in justifying the "single-phase" simplicity of the network board is the fact that all the transformers on the actual network are normally supplied from a single 22-kv. station. This minimizes greatly the risk of feeder-voltage phase-angle differences which would modify the observed results by introducing reactive circulating currents not reflected in the d.c. tests on the board.





NETWORK reproduced in miniature

(a) The electrical scale ratio is 1/100,000. There are about 500 resistor units in the board, representing about 1,000 loads and 90 transformers. Transformer resistors are 325 ohms each. Load resistors range from 15,000 to 10,000,000 ohms each and are calibrated in equivalent kw. Cable impedances are represented by flexible wire-wound resistors. There are about 500 such resistors.

(b) A map of the network is painted on the face of the board to facilitate locating the points to connect the ammeter or voltmeter. The exploring meter contacts are plugged into the appropriate manhole contact jacks to take the voltage or current readings. The toggle switches at the left represent the various primary cable feeder connections to the 90 network transformers. The meter illustrated has been superseded by the unit shown in the accompanying illustration.

(c) In schematic form the analyzer follows one phase of the actual network system closely. The direct current supplied by the power source flows to the miniature grid through the transformer switches and resistors. From the appropriate "manhole" on the grid the load currents are taken off through the load resistors to the system "neutral." The voltage drop produced in the transformer resistors and in the grid resistors is utilized to operate the sensitive "ammeter" (millivoltmeter) to obtain the "loading" information.

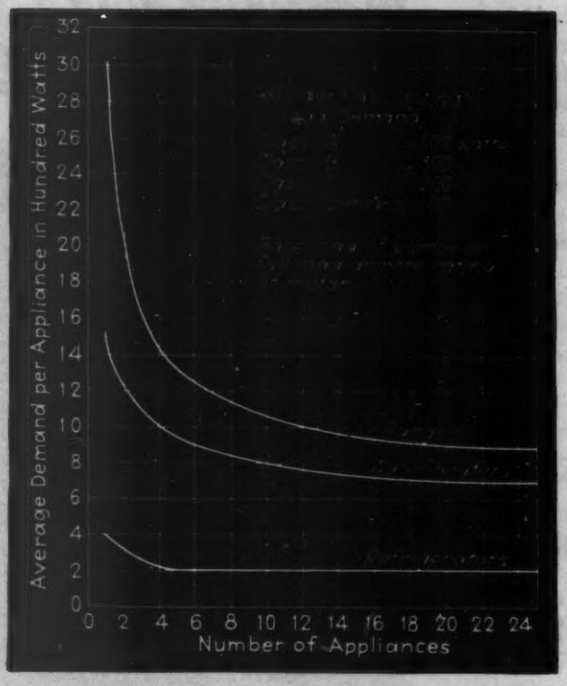
Practical Distribution Economies

Suggestions on standard specifications, handling new loads, improving service and salvaging materials that save money in distribution—How to get maintenance and operating expenses down

H. S. St. JOHN, Alabama Power Company*

WHETHER or not you have that problem licked, I wish to present for your approval some practical slants on distribution economies. These are ideas that have paid actual dividends for my company. I shall group them for convenience under the five classes of everyday jobs an engineer has to perform.

Since line construction specifications are already well standardized for most companies, it is assumed that you take advantage of quantity buying and the lower costs associated with simple designs of universal acceptance instead of insisting on costly special designs. The big pitfall about standards in large companies is the loss whenever a change is made. For example, the change from indoor type meters to outdoor socket type meters presented the huge problem of what to do with numerous indoor models removed. To convert them to socket type costs about $3.50 each on the average, including socket, while to use them "as is," in a $2 outdoor metal box, is cheaper by $1.50. Therefore, standards should be flexible.



BY TABULATING test data useful appliance demand diversity curves can be made for computing demands on transformers and secondaries

More to Think About

Other specific points for standard specifications are:

1. Voltage regulation limits to insure uniformity in design practice should be set. One recommended schedule is: (a) 3 per cent for secondary drop; (b) 3 per cent for transformer regulation; (c) 2 per cent for primary line drop.

If the transformer regulation is limited to 3 per cent, the maximum kva. loading by test will become about 135 per cent of rating, and that automatically settles the long, wheezy discussions about whether to load transformers to 125 per cent or 175 per cent.

2. A standard lamp voltage that will best fit in with conditions and equipment on your system should be adopted, bearing in mind, however, that standard appliance coil ratings are now based on 118 volts.

3. Weatherproof primary wire simply cannot be justified except in special cases. Conductors that had to be resagged every summer have convinced us all that hard-drawn wire only is practical economy.

4. Whether or not to use "C.S.P." transformers depends on where the inherent advantages of that design having no primary fuses to blow from lightning and with a breaker to protect against bare secondaries can be used to lower operating costs. Although an economic analysis will probably show them to have a cheaper first cost both in urban and rural territory than conventional units with primary fuses and arresters, yet in the practical application there are several locations in town where conventional units are preferable. These are principally in three-phase banks where the Deïon gaps might be duplicated on each phase, and on the larger loads where trouble might be experienced in reestablishing service after a breaker has tripped from overload.

5. Radio-proof insulators still cost slightly more in highly competitive markets. If you don't *need* them, they aren't worth any more. For instance, we have found that the ordinary glass unit used on lines below 5 kv. is trouble-free at its normal voltage and that units with 40 kv. wet and 70 kv. dry rating do not start giving trouble as long as the line-to-ground voltage is below 12 kv.

6. Buying switch insulators with ratings about the same as line insulators is like buying a bullet-proof vest with holes in it. Give your

*Distribution engineer.

switch insulators a margin of at least 20 per cent over your line insulators.

7. Why not give your insulators a break in the ground wire down the pole? If you ground the pole-top pins on rural lines a 2-in. gap cut in the ground wire near the pin will take a load off your insulators. On the other hand, extending the common neutral up the pole near the top has saved many a pole from being shattered by lightning.

8. Ground resistance tests are often startling and enable money to be spent in the right places for securing better grounds. High resistance grounds render practically useless the investment made in arresters.

9. Pole specifications have been drastically altered in the last five years—probably too much from an economical standpoint. After putting in hundreds of miles of Class 7 poles, the pendulum is swinging back to slightly higher classes in a number of places.

10. New splicing and tap machines and sleeves are being pushed as never before. Although the new sleeves are the same price as the older, conventional sleeves, can you justify junking the many twisters and dies now on one or two hundred line trucks and buying new ones to make a doubtful saving in labor? The economics of construction work are often in conflict in this respect with considerations of maintenance. A new type of solderless sleeve machine designed for underground cable application is a good illustration of a new practical tool.

11. Lead cable standards may result in your having to keep specially trained joint wipers on hand at certain locations, when non-metallic cable would serve just as well.

12. Type S.E. cable services can only be economically justified from the standpoint of preventing unauthorized use of current at or near the entrance weather head.

Serving New or Increased Loads

Let us first discuss rural line construction:

1. County-wide rural projects—if they can be worked out financially—materially reduce the initial cost per mile from inception to completion.

2. Competent engineers in charge of staking out parties pay good returns in lowering both construction and operating costs by proper route selections.

3. The voltage change from delta to wye needs no further mention to emphasize its saving in wire, insulators and protective devices, and in providing additional capacity.

4. Small investments in modern relaying equipment properly co-ordinated with line sectionalizing devices can save major expenditures for installing additional sources of supply or substantial equipment.

5. If it is wiser to dodge trees than go over them, it has often proven cheaper to secure an easement to go around them on private property.

6. All right-of-way easements should contain tree-clearing clauses to save annual trimming expense on thousands of miles of line.

7. A trial of conductors like bronze and steel has convinced us that it is very difficult to locate them so that they won't have to be removed later when the line is extended further.

8. Small transformers for lighting service only, such as the 1½-kva. size, are of doubtful economy even in rural service. Refrigerator and pump starting currents cause less flicker on 3 kva. than 1½-kva. units. A 3-kva. unit also handles a range nicely where there are only one or two lighting customers per transformer.

9. Economics of secondary design are automatically taken care of on rural systems by the practical limits to voltage regulation and short-circuit current. Nine hundred-foot runs of No. 6 copper equivalent each way from the transformer are the maximum, providing sufficient voltage for lighting and refrigerator loads at the end, and enough short-circuit current to open transformer breakers.

Urban system additions for new loads also permit of economies:

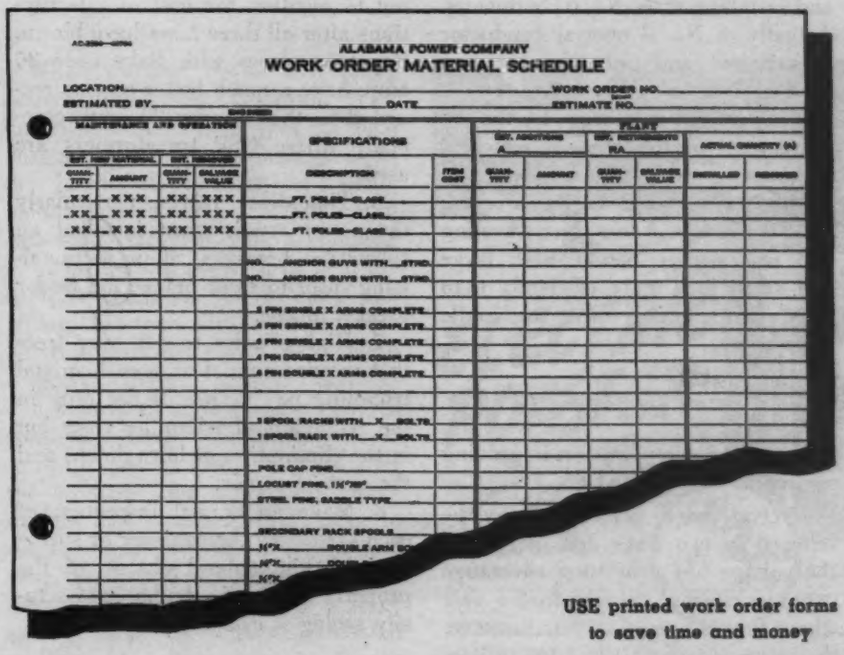
1. Making best use of what is already installed with as little change as possible consistent with good service is the recommended basic formula.

2. The plan having the highest salvage value on removal is nearly always the best. For instance, this doctrine favors more transformers and less wire, regulators instead of larger copper and unit substations instead of larger substations with numerous circuits.

3. A continual test program revealing voltage conditions and transformer loading will save more money than any other activity.

4. Ratio limits of construction costs to revenue have been set up by most companies as a guide to the field of desirable business, but some engineers I have known think they are overlooking something unless they run in extraneous general improvement items because there is a margin left between the necessary costs to serve the new load and the maximum allowable expenditure. Such general improvements should naturally stand on their own feet.

5. Joint use of poles with telephone companies is practical economy.


ALABAMA POWER COMPANY
WORK ORDER MATERIAL SCHEDULE

LOCATION _____ WORK ORDER NO. _____
ESTIMATED BY _____ DATE _____ ESTIMATE NO. _____

MAINTENANCE AND OPERATION | SPECIFICATIONS | PLANT

INST. NEW MATERIAL | INST. SECONDHAND | DESCRIPTION | ITEM COST | DEV. ADDITIONS A | DEV. RETIREMENTS RA | ACTUAL QUANTITY (a)

QUAN-TITY | AMOUNT | QUAN-TITY | SALVAGE VALUE | QUAN-TITY | AMOUNT | QUAN-TITY | SALVAGE VALUE | INSTALLED | REMOVED

XX | XXX | XX | XXX | FT. POLES—CLASS
XX | XXX | XX | XXX | FT. POLES—CLASS
XX | XXX | XX | XXX | FT. POLES—CLASS
NO. ANCHOR GUYS WITH STRD.
NO. ANCHOR GUYS WITH STRD.
PIN SINGLE X ARMS COMPLETE
PIN SINGLE X ARMS COMPLETE
PIN SINGLE X ARMS COMPLETE
PIN DOUBLE X ARMS COMPLETE
PIN DOUBLE X ARMS COMPLETE
SPOOL RACKS WITH X BOLTS
SPOOL RACK WITH X BOLTS
POLE CAP PINS
LOCUST PINS, 1¾"
STEEL PINS, SADDLE TYPE
SECONDARY RACK SPOOLS
¾"X DOUBLE ARM
½"X
⅝"X

USE printed work order forms to save time and money

6. To bank or not to bank secondaries has produced more economic studies than anything in recent years, yet an actual examination of the secondary maps of any town to determine just what banking *can* be done to advantage is the first practical step in making a decision. Load densities and growth of secondary systems in most small towns have not advanced far enough to permit benefits from this practice to offset the disadvantages.

7. Larger service conductors are usually installed when a lighting customer buys a range, and many companies follow a practice of retiring the two No. 8 conductors formerly used and installing three No. 6 conductors. Actually, a No. 8 neutral conductor is sufficient and only the hot legs need be No. 6.

8. Does the line crew fit the requirements of the area in which it operates, both as to number and equipment? Small crews covering small areas spend less time traveling and can usually handle both large and small jobs more efficiently than large crews endeavoring to handle large areas.

Service Improvement

Now for some points on improving service:

1. Overloaded primaries may be relieved in two ways, but increasing the voltage has a decided advantage over increasing the conductor size where this is possible. For instance, the increase from 2.3 to 4 kv. utilizes the wire, insulators, transformers and substation equipment already installed. The same can be said for the increase from 6.9 to 11 kv. wye. Maintenance expense is also reduced in that the number of arresters and fuses is cut in half and more positive relay action secured on faults.

2. Step-voltage regulators have never been fully accepted by a number of operators as a substitute for induction regulators, probably for the reason that they advance the necessity of sensitive control. If step regulators had preceded induction regulators, I am sure that few would see any justification in the increased cost of the latter. From a practical standpoint you cannot set the voltage relays on induction regulators closer than a three-volt band, so why not use 1¼ per cent steps and pocket the difference?

3. Relieving overloaded secondaries and transpormers in the proper sequence requires that the copper be loaded up first to its regulation limit, and then kept within that figure by adding transformers and shortening cribs. Secondary copper should be increased only as a last resort and transformer positions should be shifted as little as possible.

4. Repeater fuses on rural lines are decidedly more economical than the single-shot variety.

5. Pole type reclosing breakers on rural lines over 15 miles long will usually pay for the increased cost over repeating fuses in a few years in saving of fuse replacement only, not to mention the cost of interruptions after all three fuses have blown. Repeating fuses with links over 20 amp. have a much better service record than those under 20 amp. especially where CSP transformers are used.

6. Time-delay relays, particularly the newer types, when installed on substation breakers, allow sectionalizing fuses to clear before the feeder breaker opens.

7. Higher poles to get over trees that require annual or even biannual trimming pay dividends not only in the reduction of trimming costs but in the elimination of burn-downs and the cost of repair.

8. Make an annual inspection of each system by the engineer or superintendent in general charge of the property but not in the habit of actually seeing it every day.

Savings in Replacements

Economies are possible in replacing and retiring property:

1. In merely replacing equipment after failure, the excellent possibilities for practical economy are often overlooked. The fact that the item of equipment failed may point to a needed improvement somewhere. Before ordering a replacement just like the one you put up several years ago, why not cast about and see what else is available?

2. Sometimes when certain equipment fails the cheapest thing to do is to junk it on the spot, even though the cost to repair it might be much less than a replacement.

3. Odd voltage ratio transformers sometimes present quite a problem in finding use for them without rewinding. In the case of 18 to 1 ratio transformers, they might be concentrated into one or more areas in a city and the primary voltage reduced 10 per cent on the feeder supplying this section by the installation of buckers.

4. The margin between the price of scrap copper and that of new wire is large enough to permit efficiently planned wire salvaging operations.

5. It is hard to find the loss of a patented anchor with the rod sawed off at the ground line, but it is also easy to see the saving in using 50 cents worth of labor to dig up a reusable anchor valued at $2.50.

6. In fact, there's so much "gold in them thar" salvage piles that the more frugal companies require an engineer's inspection and approval before junking any piece of equipment not included in the regular junking rules.

Ways to Economize

Part of distribution economy lies in reducing operating and maintenance expenses. Operating routines and methods of doing work deserve the attention of the best distribution engineers in a company. Construction work should not be allowed to corner the market of engineering talent. The services of a good engineer devoting his time to methods, tools, equipment and transportation soon start the cost per customer of distribution expense on a downward trend. Combination crews that do both maintenance and light construction jobs are an aid in this respect.

Some examples of changes and improvements in tools and methods are:

1. Decreasing the frequency of transformer inspections to once every two years.

2. More than $10,000 worth of meters are removed from service each year on our system due to failure from lightning. How economically to reduce this figure is and will continue to be a problem. Assuming a cost of replacement and repair equal to the value of the shot meters, this amount is considerably less than the annual cost on 150,000 meter protectors or arresters with a cost new of $1 each and a life of twenty years. If by spotting the location of each meter failure on a map certain hot-spot areas appear, then the economics of that particular section may work

[*Continued on page 132*]

Roasters Selected as Load Building "Natural"

Southern California Edison pushes a three-year program due to roaster acceptance by customer and dealer — Large market potential and contribution to electrical living

H. C. RICE, Southern California Edison Company, Ltd., Los Angeles

MORE than three years ago we were looking for some product which would lead to new net revenue without the threat of load mortality, that would not introduce heavy wiring expenses, that would be priced low enough for us to use for our low-bracket income customers, popular enough to attract dealer co-operation and with sufficient possibilities for customer acceptance to constitute a definite step toward electrical living.

We were finding that too many electric appliances which had been sold to the householder found their way to the closet shelf or were used so seldom that they hardly warranted exploitation because of their small use value and revenue expectancy.

We began casting about for those "plug-in" devices which were definitely out of this category and, because of acceptable use value, would be often used, and we also looked for those which would promote "electrical living."

"Flivver Range"

After careful analysis and test we found that electric roasters ranked exceedingly high in this respect as they were everything the manufacturers claimed in good construction and, due to their fine cooking results, they would certainly whet the user's appetite for electric cooking, thus paving the way for an electric range later. Another factor in the roaster's favor was its appeal to the low income bracket group of purchasers, as its price is under $30 and requires no special wiring. As the saturation was under 3 per cent, this gave us a wide market.

When we first began advertising roasters they were emerging from the evolutionary stage that all such devices seem to go through; that is, they had developed from just a small, oblong casserole into a portable oven sufficiently large to cook a complete meal for several people. In fact, the complete facilities for broiling and frying, together with accurate temperature control, make the modern roaster a "flivver" electric range.

Few dealers at this point handled roasters. Large department stores were the main outlets. Shortly after the roasters were advertised, many dealers had inquiries and began to display them. At the end of the first year, further to check the possibilities of sale, we called upon a large number of people who had purchased and owned a roaster six months or more. Their satisfaction and enthusiasm gave assurance to the fact that the roaster was a "natural," hence the large program we have pursued ever since.

Many of those selected at random and interviewed said they were surprised at the small operating cost. When they were asked about how much it had increased their bills, they didn't know exactly, but the devices were so satisfactory they were no longer watching the meter and had grown to use their roasters for from 20 per cent to 80 per cent of their baking, roasting and preparing complete oven meals. It was evident, however, that those who kept their roasters in the most convenient places used them most.

This fact indicated a need for a table to be included with each roaster sold. Now, as each late model

NOW
LOTS OF FOLKS DO MOST ALL THEIR COOKING ON AN ELECTRIC ROASTER
THAT'S BECAUSE ELECTRIC COOKING IS SO MUCH EASIER AND BETTER
ELECTRIC ROASTER Sale
only $3 down
The Cool Way to Cook Delicious Summer Meals
LOW PRICES AND EASY TERMS ON ALL POPULAR MAKES
ON DISPLAY AT YOUR DEALER OR EDISON OFFICE

LATEST SERIES OF ADS placed by Southern California Edison features five NEMA roasters, stand or table equipment to avoid load mortality and a time-payment plan made available to registered dealers through the company and Bank of America

roaster has an "Off" switch, it is even more convenient, as it can be left plugged in and setting out upon the table. No longer is it necessary to lift it down from shelves or out of concealment.

Another thing our survey showed was that nearly every user suggested an easily cleaned broiler and griddle attachment. Taking advantage of

[*Continued on page 136*]

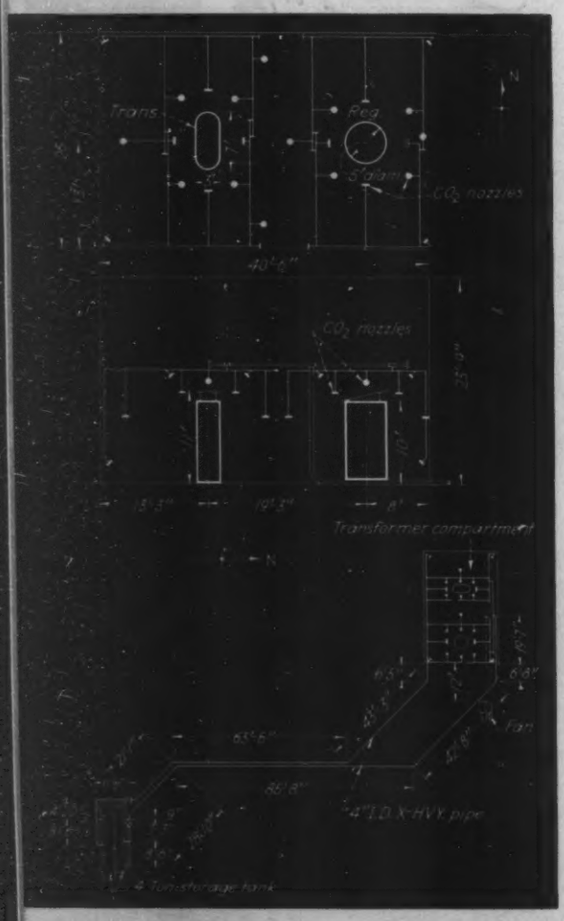
Try CO_2 in Bulk on Big Outdoor Oil Fires

Simulated substation fire involving 3,000 gal. of transil oil extinguished in one minute by bulk discharge of 6 tons of liquid CO_2 from a low-pressure central storage system

RESULTS of tests to evaluate the effectiveness of mass carbon dioxide discharges in combating major outdoor oil fires in and around semi-inclosed and uninclosed transformers made on the property of a large utility company revealed the following facts:

1. Test fires involving transformers containing 3,150 gal. of transil oil, burning for eight minutes 30 seconds and six minutes 20 seconds before application of gas, were extinguished in 60 and 85 seconds by CO_2 discharges of 5.9 and 7.7 tons respectively, depending on whether the tanks were semi-inclosed or open.
2. Mass CO_2 discharge extinguished the fire and cooled heated parts enough to prevent reignition, regardless of whether open or partially inclosed.
3. Gas is effective regardless of wind condition up to a velocity of at least 30 miles per hour.
4. Smoke is apparently precipitated by mass discharge of gas, reducing possibility of soot formation on insulators.

SIMULATE severe transformer fire in outdoor utility station—two tests in semi-inclosed and entirely open transformer compartments with gas discharge nozzles arranged, as shown, around partially open oil-filled transformer tanks



Set-up for the tests is shown in the accompanying diagram. Two old transformer tanks, one oval with an oil capacity of 1,650 gal. and the other round with a capacity of 1,500 gal., were placed on a cinder-covered clay "floor" area 40½x26 ft. and filled with old transil oil having a flash point of 280 deg. F. and a fire point of 300 deg.

To combat the fire liquid CO_2 was supplied from two 4-ton tanks of a low-pressure central storage system through 4-in. extra-heavy pipe to 25 discharge nozzles, each having four ⅝-in. diameter ports and arranged around the transformer tanks as shown. Between tests the storage tanks were replenished from a railroad tank car on a convenient siding. Gas flow was under hand control.

The test was in two parts. In the first part walls of corrugated iron were erected on three sides of the transformers and a fan was used to produce an artificial wind of 30 m.p.h. blowing into the open end of the inclosure. To produce a brisk fire, oil for both tests was preheated to 155-255 deg. F. before ignition, and during the fire oil was caused to overflow the tank by admitting water to the tank floor. Lid of the oval tank was raised to allow it to be heated as high as possible by the fire and to simulate an explosion condition. Cover of the round tank was tilted up in front and several small distribution transformer coils and cores were partially immersed in the oil to produce the effect of hot metal and burning insulation at oil level. Thermocouple equipment recorded temperature at various points in the compartments. Sequence of events for test No. 1 are as follows:

Minutes	Seconds	
0	0	Oil in round tank fired.
1	20	Oil in oval tank fired.
4	20	Oil spilled from oval tank.
5	30	Fan turned on.
8	30	CO_2 gas applied.
9	30	CO_2 gas turned off—fire out.

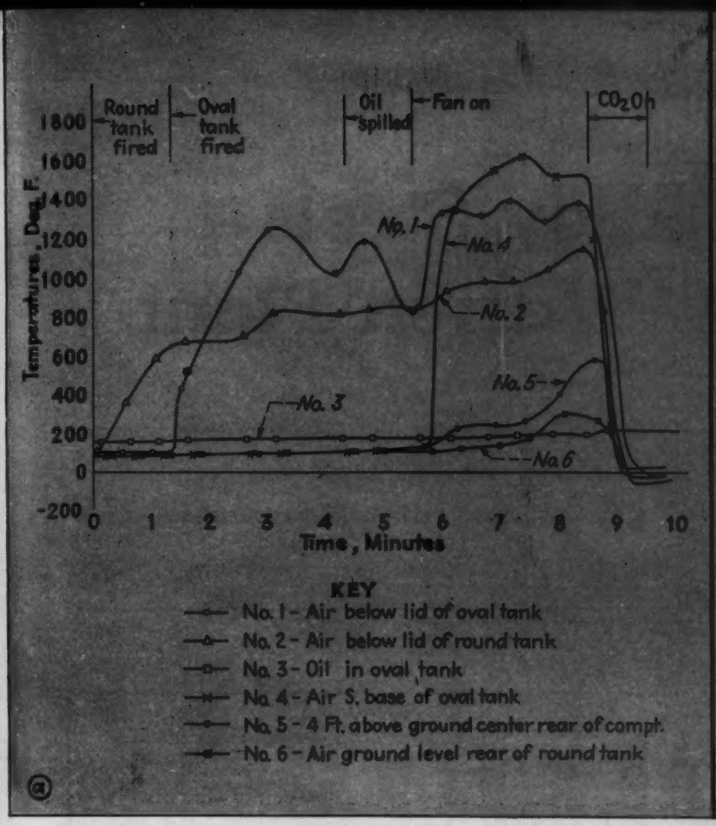
Temperatures are shown in the accompanying chart. Valves of the gas supply were open exactly 60 seconds, during which time 11,713 lb. of CO_2 were discharged. Drifts of carbon dioxide snow were 3 to 4 in. deep around the area after the fog cleared. High CO_2 concentration was obtained in the fire zone.

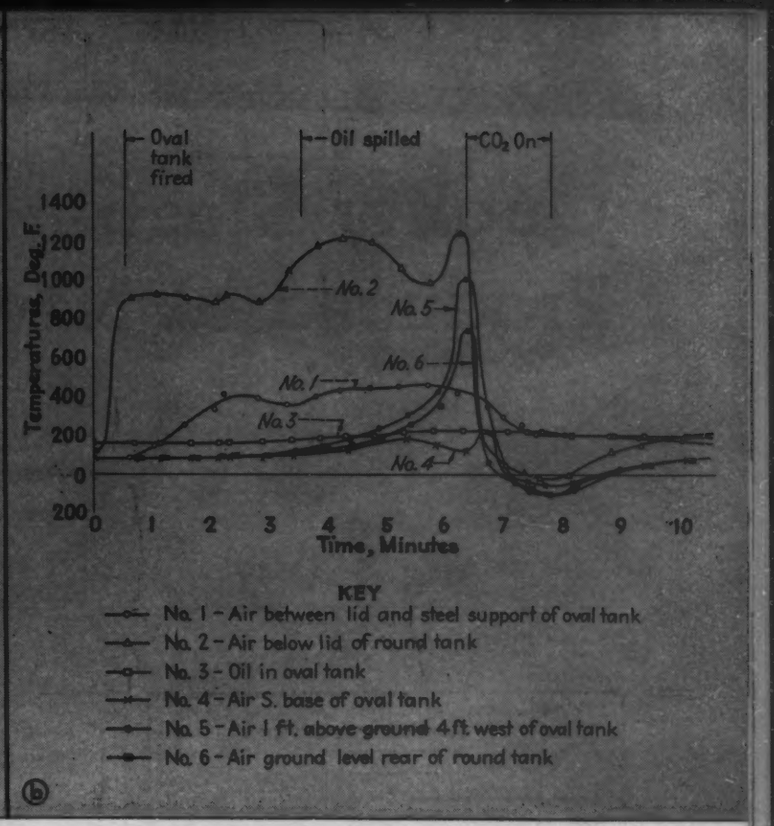
In the second test the corrugated iron partition was removed from around the transformers, the artificial wind was done away with and only normal wind of 11 m.p.h. was blowing.

Sequence of events for test No. 2 were as follows:

Minutes	Seconds	
0	0	Oil in round tank ignited.
0	30	Oil in oval tank ignited.
3	30	Oil spilled from oval tank.
6	20	Co_2 gas turned on.
7	45	CO_2 gas turned off.

Temperatures are shown on the accompanying chart. Wind carried the fire away from some thermocouples, so temperatures recorded are lower than in previous test. Fire was more severe than in the inclosure. During the one minute 25 seconds gas discharge 15,380 lb. of CO_2 was applied to the fire area.


Round tank fired
Oval tank fired
Oil spilled
Fan on
CO_2 On
Temperatures, Deg. F.
Time, Minutes
No. 1
No. 4
No. 2
No. 3
No. 5
No. 6
KEY
No. 1 - Air below lid of oval tank
No. 2 - Air below lid of round tank
No. 3 - Oil in oval tank
No. 4 - Air S. base of oval tank
No. 5 - 4 Ft. above ground center rear of compt.
No. 6 - Air ground level rear of round tank
a


Oval tank fired
Oil spilled
CO_2 On
Temperatures, Deg. F.
Time, Minutes
No. 2
No. 5
No. 6
No. 1
No. 3
No. 4
KEY
No. 1 - Air between lid and steel support of oval tank
No. 2 - Air below lid of round tank
No. 3 - Oil in oval tank
No. 4 - Air S. base of oval tank
No. 5 - Air 1 ft. above ground 4 ft. west of oval tank
No. 6 - Air ground level rear of round tank
b

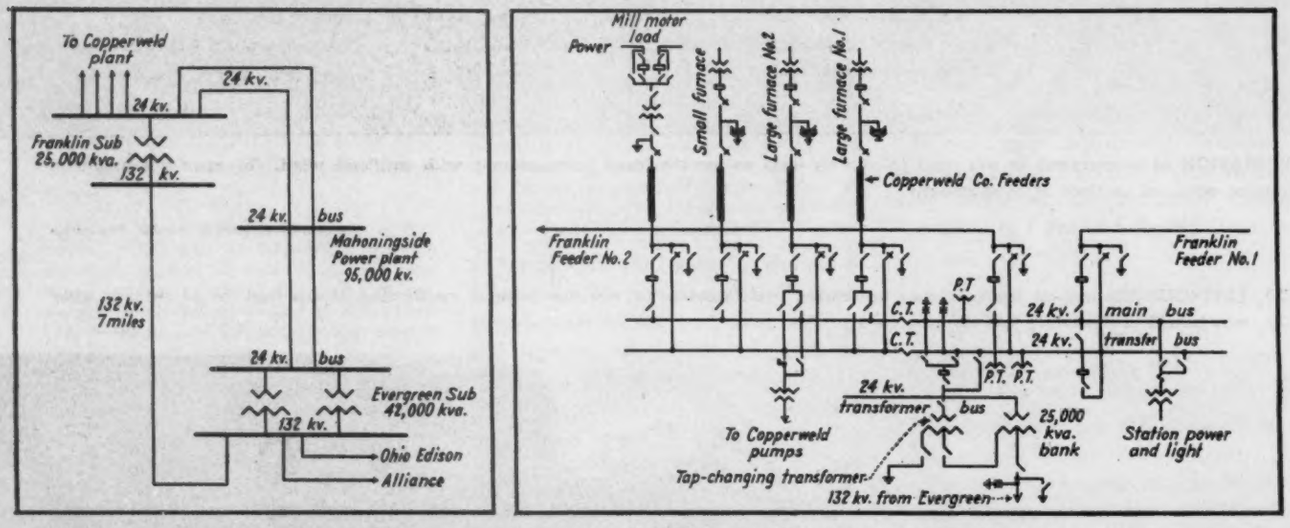
VARIATION of temperature in test area (a) during tests on semi-inclosed compartment with artificial wind, (b) open compartment, natural wind, oil on floor of compartment

Illustrations courtesy Cardox Corporation

CO_2 EXTINGUISHES test oil fire involving uninclosed transformers—(a) fire just prior to application of gas and (b) 30 seconds after CO_2 was turned off, showing gas clearing away

Quality Electric Alloy Steels Produced at New Warren Plant

Copperweld Steel Company sets up electric furnaces, blooming mill and bar mills to handle 20,000 tons per month of automotive tool, stainless and oxidation-resisting steels



NEW Copperweld mill supplied by 132-kv. and 24-kv. lines to 25,000-kva. substation (left). Double bus on 24 kv. affords opportunity to allocate furnace loads to either for segregation from mill load—tap changer has four 2½ per cent taps for voltage regulation (right)

TO MAKE the steel that forms the core of Copperweld products as well as to supply quality alloy steels to the trade Copperweld Steel Company has set up at Warren, Ohio, a plant capable of electrically melting 10,000 tons of ingots and rolling 20,000 tons of finished billets, bars and rods per month. Everything about the plant, from 132,000-volt service to the machine shop motors, is electrical except the gas-fired blooming-mill heating furnaces. Of particular interest to industrial electrical engineers will be the scheme for transferring furnace loads between main and transfer buses and the large size (relative to tonnage rating) of the transformers serving the melting furnaces.

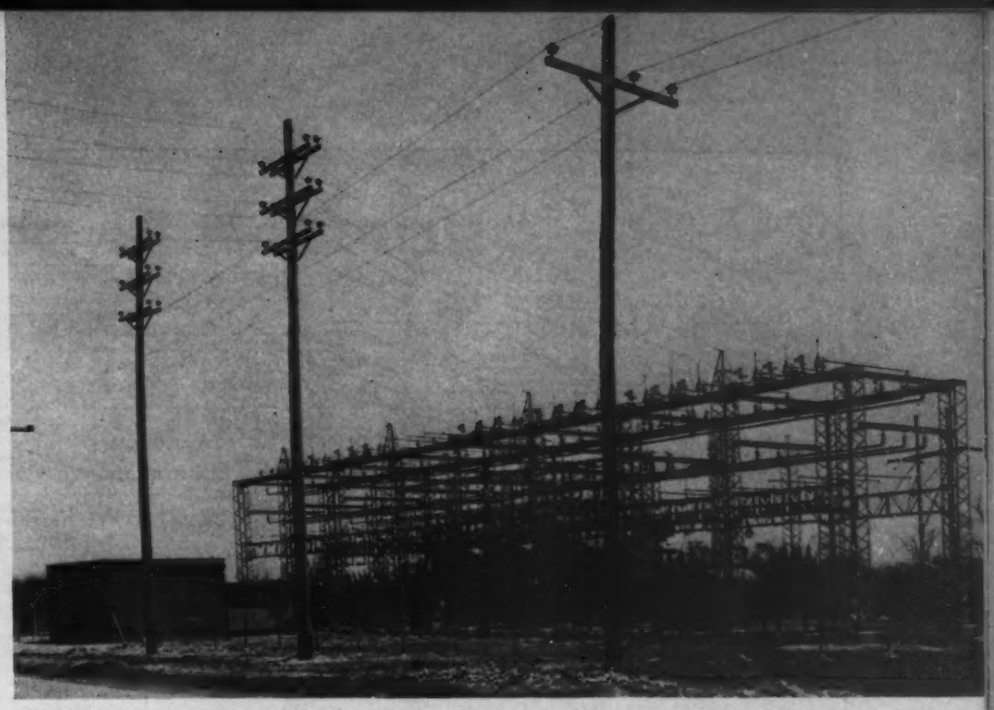
The new plant will have a demand of 25,000 kw., of which 20,000 kw. will be taken by the two 25-ton Swindell and one 6-ton three-phase furnaces and 5,000 kw. for the rolling mills, general mill operations and lighting. To supply this load the Ohio Public Service Company has established a new 25,000-kva. substation (called Franklin) adjacent to the plant. It will be a 132-kv. line 7 miles long from the O.P.S. transmission system. Two other feeds will be 24-kv. lines from the Mahoningside power plant into the 24-kv. bus of Franklin substation. This is the basis for switching melting furnace loads between buses so as to control the magnitude of voltage dips from furnace starting and operation.

Copperweld No. 2/0 seven-strand KB conductors with four strands of Copperweld strand and three of copper are used in the 132-kv line. The structures are H-frames with double-plank arms and two overhead ground wires. Dead-end structures are guyed with standard wood-strain insulators having protecting arcing horns.

Transformers at Franklin substation are single-phase, totaling 15,000 kva. of self-cooled rating (25,000 kva. water cooled). They will, however, be air-cooled through the medium of supplementary Griscom-Russell radiators, through which the oil will be forced for cooling. This set-up will allow loading of the transformers to full rating of 25,000 kva. Two 30-hp. motors drive the fans supplying air to each of the three coolers. The 24-kv. feeders are constructed of No. 4/0 Copperweld type F conductors having six strands of copper and a strand of Copperweld.

Addition of this load to the power system is in part the occasion for an increase in generating capacity of the Mahoningside power plant from 50,000 kw. to 95,000 kw. The Ohio Public Service Company con-

tract with the steel mill calls for 24 kv. delivery from the Franklin substation 24-kv. bus. Metering is with Westinghouse type RI-32 totalizing kva. meters for two circuits. The plant expects to install a demand limiter to hold the maximum to 18,000 kw. When the 6-ton furnace is in operation the demand will be allowed to go to an additional 2,500 kva. Power factor is about 0.80, partly as a result of synchronous motors on the motor-generator sets for d.c. supply. Each of the two sets has a 2,300-volt, 1,050-hp. synchronous motor driving a 750-kw., 3,000-am., 250/230-volt d.c. generator.



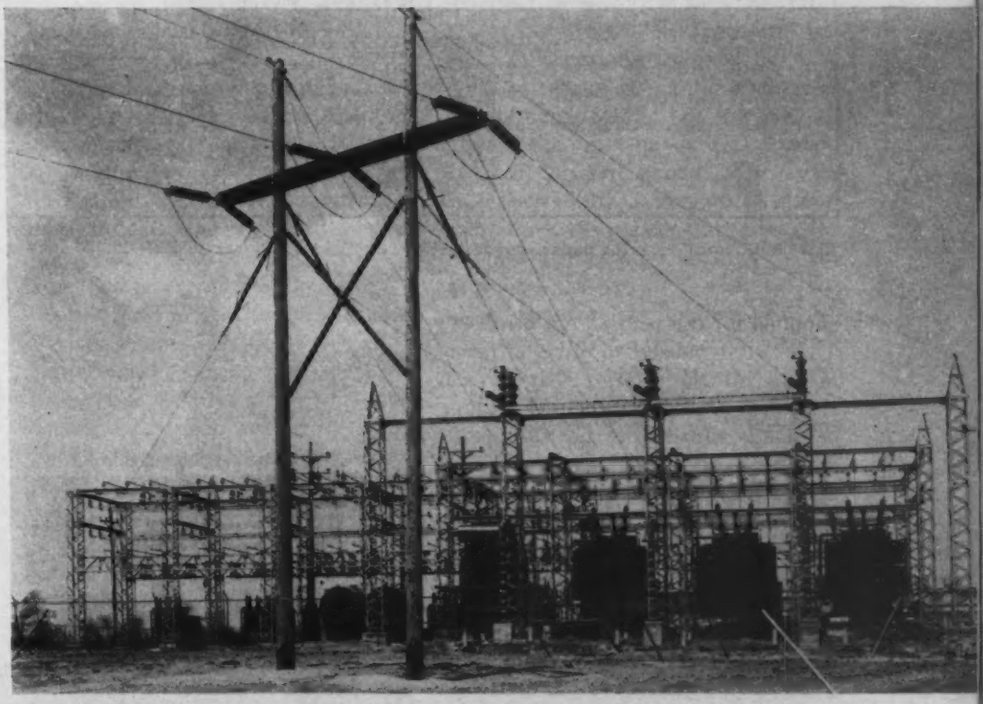
TAKE-OFF for four 24-kv. feeders into plant are on near side of this 25,000-kva. substation of Ohio Public Service adjacent to Copperweld mill

Electric Furnaces

From the 132/24-kv. substation there are four 24-kv. feeders into the Copperweld plant. Each has No. 4/0 type KB Copperweld conductors on wood arms on the getaway structure with wood braces. The guys are $\frac{1}{2}$-in. Copperweld. The overhead ground wire is $\frac{3}{8}$-in. Copperweld grounded at the base of each pole to a $\frac{5}{8}$-in. by 8-ft. Copperweld ground rod.

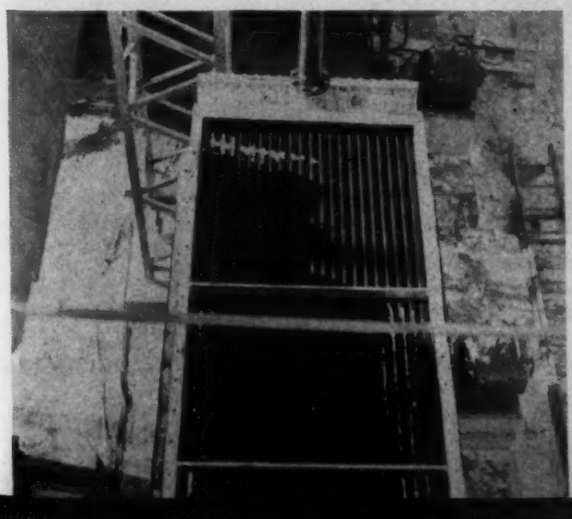
There is a substation provided for each of the three furnaces and one for the 2,300-volt rolling mill and the merchant mill load. Each 24-kv. feeder dead-ends at single poles, which are, however, guyed to the building and near enough together to be tied together with plank bracing. Delta-Star disconnects and G.E. arresters precede the Kennecott cables running to the transformer control panels.

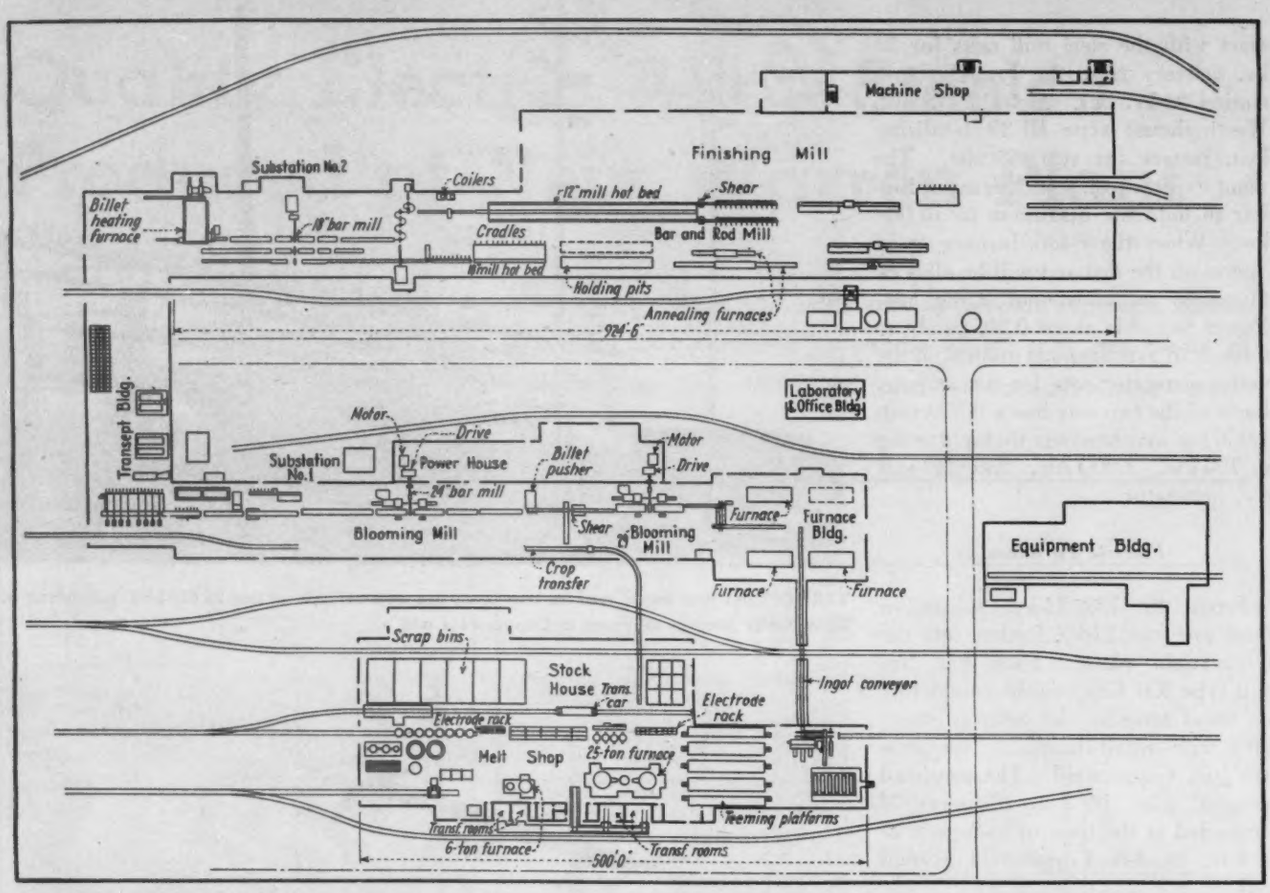
For each of the two present 25-ton Swindell three-phase melting furnaces there is a Westinghouse 12,000-kva., 23,000/290-volt water-cooled transformer. These are believed to be the largest capacity transformers ever



ONE OF THE 132-kv. feeder structures using plank arms and two overhead ground wires

OIL for the 132/24-kv. transformer is pumped by two 30-hp. motor-driven fans through Griscom Russell radiators for cooling (left). Two 25-kv. feeders terminate here adjacent to the furnace transformer compartments (right)

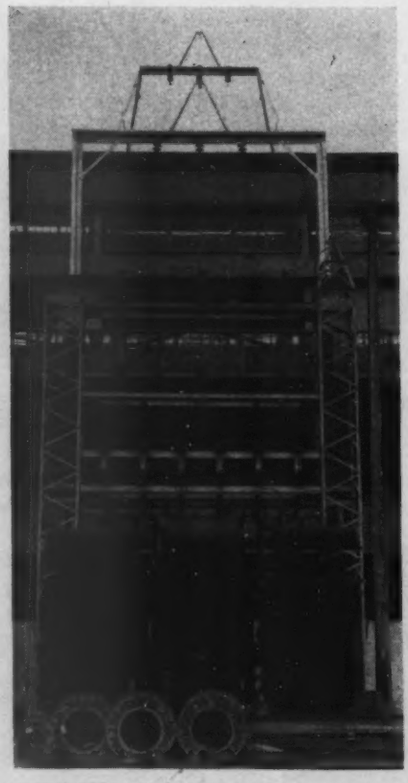




NEW MILL has 7½ acres under roof of modern daylight structures to melt 12,000 tons and roll 20,000 tons of alloy steel per month

supplied for use with 25-ton furnaces. They were chosen to give a rapid melting of the charge. By saving time in charging and melting a longer time is afforded for the all-important refining period. Complete charging of these top-charged furnaces is accomplished in less than ten minutes by means of a transfer car and crane handling the charging buckets loaded with selected scrap. The excess capacity provided in the furnace transformer gives the ability to melt a 75,000-lb. charge, if desired, in three to five hours. One trial run of 60,000 lb. was completed with 12,000 kw. input at 0.85 power factor. Nevertheless the relatively small size of charge permits close control of metal pouring temperatures and avoidance of the segregation of constituents by equally close control of what is known as the teeming speed.

An additional factor designed to maintain uniformity and quality of the poured ingot is that the largest used will be only 2,100 lb. This moderate size will afford fine control of crystallization and grain size and also, in itself, minimize segregation. Another contribution to regulated product lies in the control of the rate of solidification of the molten steel. Here again the mold design, metal temperature and pouring rate are adjusted to give optimum conditions.



OVER THE ROOFS to the power station is the 24-kv. supply to this 6,000-kva. substation for mill drives and lighting

Furnace Control

The 12,000-kva. electric furnace transformers are provided with taps of 110, 138, 190, 240 volts on the 290-volt secondaries. Also provided are four steps of hand-operated reactance with 0, 5.5, 10.5 and 15.6 per cent impedance values. The control equipment also embraces a 400-amp. Westinghouse gang disconnect Corey key-interlocked with a 600-amp., 23-kv. Westinghouse oil circuit breaker.

The transformer secondaries terminate in laminated conductors consisting of 24 bars of ¼ x 8-in. copper spaced parallel at 28-in. spacing between phases. The flexible cables between transformer and electrodes are water cooled and have a very desirable safety feature in that they are insulated from one another by their rubber hose containers, which is be-

[*Continued on page 135*]

Resuscitation Performance—How Effective?

Tests of over one thousand employees with instrument indicate that more than half the employees are unsatisfactory in their prone-pressure application and need more practice or retraining

H. G. HAYS,* Ohio Public Service Company

EVERY public utility employee has wondered occasionally whether his style of administering artificial respiration was really effective, whether his hours of practice have produced anything besides fatigue and whether he could maintain life in a suffocated patient. The instructors, lay or professional, were not always able to satisfy the doubts, for they had nothing tangible with which to prove the point. The disappearance of the pulse soon shows the doubtful that the digital pressure on the artery would prevent hemorrhage; what comparable measure would indicate that prone pressure was ventilating the patient?

Many times the instructor has become the victim in practice in an effort to determine the effectiveness of a performance. If he said the hands were too high and received the comment, "So what?"—he was stumped. Words, spoken or written, were his only proofs. No tests were possible, no apparatus was available that would answer the skeptic and aid the instructor.

The Ohio Public Service Company has 35 lay instructors, some of whom have more than ten years experience in teaching first aid. When the general safety committee became acquainted with the artificial respiration trainer, manufactured by the Mine Safety Appliance Company, it was not long in reaching the conclusion that here was an answer to a major share of the problem. The trainer was first used in the annual safety field meet in September, 1939. After several months of experiments it was decided to test all employees with it.

The trainer is simple in principle, but rather complex when it comes to mechanism. The patient is placed on an inflated pad with internal pressure balanced to the patient's weight to bring the pressure pen of the instrument to zero. It then measures (right-hand pen) the pressure applied to the patient's back as each forward stroke of artificial respiration is performed. The left pen indicates the amount of air expelled at each forward stroke. The latter is measured by a volume chamber, into which the expelled air is carried by the flexible hose attached to the face-piece the patient is wearing. The chart runs for five minutes, with fifteen-second divisions for convenience in checking timing and its variations.

The following results were obtained from a test of 1,055 employees:

Excellent, 10.9 per cent.
Satisfactory, 33 per cent.
Need practice, 52.9 per cent.
Retrain, 3.2 per cent.

Ninety-five per cent of those test-

*Secretary general safety committee.

OPERATOR at top of pressure stroke, just before release of pressure. Note that both pens have moved toward center of chart. Right pen is pressure with 10-lb. graduations up to 120 lb. Left is volume of air expelled, graduations in hundred cc. with limit of 1,500 cc. (left). Operator in rest position. Note that pens have both returned to zero position (right)

ed would be able to maintain life for eight to ten minutes in a suffocated person. Slightly more than 10 per cent of the personnel had not been employed long enough to complete their training for the American Red Cross Standard First Aid Certificate. The requirement that all employees qualify for that certificate probably explains the large percentage having some skill in applying artificial respiration.

Ratings after Tests

Excellent — Operators producing exceptional ventilation, 1,000 cc. or more, with applied pressures of 40 lb. or less. Timing twelve to fifteen per minute with little variation in the five-minute test. General performance smooth, with so little apparent effort that there was no doubt of their ability to maintain the performance for at least fifteen minutes without fatigue and without discomfort to the patient.

Satisfactory—Operators producing ventilation above normal requirements, 600 cc., with pressures below 60 lb. Pressure and timing not quite so uniform as in the "Excellent" classification. Some technical defects, which do not seriously reduce effectiveness, as the operator appears able to carry on for fifteen minutes.

Need Practice — Operators not reaching 600 cc. expelled air, having pressures that are excessive, or are quite variable, or possessing errors in timing and rhythm. It is evident that they are ineffective and are incapable of performing for fifteen minutes, yet the defects can be corrected and the technique improved with further practice.

Retrain—Individuals so ineffective on several patients, or possessing major technical defects, that it would indicate a lack of familiarity with the standard technique.

There has been no attempt to grade results other than to classify them according to the standards given above. The relative value of the results are emphasized. Classification is not entirely dependent on the instrument, but trained lay instructors are always on watch for errors which may reduce the effectiveness or produce discomfort for the patient. The opinion of the patient concerning comfort is also considered.

Very few charts falling into the

[*Continued on page 66*]

85 Ft.-Candle Drafting Room Lighting

Illumination increased almost eight times with same wattage through new idea embodying fluorescent lighting in continuous troughs on 3-ft. centers with vertical louvers inserted in sound-proof ceiling

WALTER J. LEEMHUIS, Pittsfield Works, General Electric Company

THE difficult job of properly lighting a drafting room to high levels of illumination of excellent quality has now been solved in the distribution transformer drafting and engineering department of the Pittsfield plant of the General Electric Company by a new and fundamentally different lighting system. Without changing the wattage the illumination has been increased eight times from 11 to 85 ft.-candles.

To provide high quality lighting for drafting room areas it has been the accepted practice to install indirect or semi-indirect fixtures hung from a flat ceiling of high reflection factor. Such systems would provide 30 to 40 ft.-candles of high quality, comfortable illumination. When the level of illumination was raised to 40 and 50 ft.-candles on the working plane it was found that the brightness of the ceiling and the glare resulting from low angles of vision on distant ceiling points were objectionable.

The distribution transformer engineering and drafting area is approximately 63 ft. wide by 190 ft. long, an area of 11,900 sq.ft. The level of illumination previously was about 11 ft.-candles, obtained from inclosing globes on 10x8-ft. centers, lamped with 200-watt lamps. The load was 37 kw., or about 3.3 watts per square foot.

After studying various designs of Troffer fluorescent systems, the following requirements were set up:

1. The Tulamp ballast equipment should be used to wipe out the stroboscopic effect.

2. The installation should not be tailor-made, but should be adaptable to most any type of ceiling construction.

3. There should be as little glass above the working area as possible. Since the brightness factor of a bare fluorescent 48-in. lamp is 3.2 candles per square inch, it would be unnecessary to install a hinged glass cover, with its resultant loss in efficiency.

4. The cost of relamping and cleaning should be low.

5. The Troffer should be so designed that all wiring could be done from below.

6. The cut-off angle should be about 45 deg. for normal ceiling heights so that no bare lamp would be in the field of vision.

7. Vertical louvers should be used to give an end-on cut-off and also break up the continuous row effect.

8. The reflecting surface should be a semi-matt, white, vitreous porcelain enamel finish for long life and ease of cleaning.

To accomplish this, a fluorescent lighting system was devised using 4-ft. Troffers connected into a continuous row, with rows on 3-ft. centers. Each Troffer unit is 4 ft. long by 1 ft. wide and comprises four major parts—the trough, the wireway, the louvers and the supporting "U" strap.

Glare Avoided

The trough has a 45 deg. cut-off, thus insuring good coverage on the working plane without a bare lamp showing in the occupant's field of vision, except at a very acute angle. Vertical louvers appearing every foot in a continuous row break up the end-on piling up of light and also give a 60 deg. cut-off on the bare lamp. The louvers also add to the appearance of the installation. The middle three louvers in every 4-ft. section are made with a hinged arrangement to facilitate the ease of relamping.

The reflecting surface of the trough

is semi-matt, white, vitreous porcelain enamel, providing a permanent reflecting surface, low in brightness, high in reflection efficiency, and easy to clean.

The trough is secured to the wireway by eight screws backed up by asbestos shock-proof washers.

The wireway is a housing to hold the Tulamp ballast equipment, sockets, starter switches, starting compensators, and conductors. All wiring can be done from below; maintenance is easy as the trough can be lowered, exposing all equipment and wiring. Necessary cross wiring is done at the end of a row.

Adaptable Design

The "U" strap which supports the wireway and trough is so constructed that it is adaptable to the majority of hung ceiling constructions.

The construction details of the ceiling and trough are shown.

The ceiling girders are on 8-ft. centers, hence the coffer rows are on 3-3-3-3 and 4-ft. centers for every 16-ft. section. Since ceiling tile comes in 1-ft. squares, all spacing must be in multiples of one foot.

In the completed installation, as shown, the ceiling height is 14½ ft. There is a 7-ft. metal partition dividing the drafting and engineering areas. There are 826 4-ft. Troffer units equipped with 48-in. daylight lamps at a total load of about 37 kw., or 3.3 watts per square foot.

This system gives an illumination of approximately 85 ft.-candles on the horizontal working plane and an average of 22 ft-candles on the vertical.

The engineers and draftsmen have worked under the new lighting installation long enough to note less eye fatigue, the absence of shadows and the uniformity of lighting throughout the area. Another interesting point is the blending of the fluorescent light with natural daylight.

The cost of the completed ceiling job was somewhat more than $1.50 per square foot. This cost includes the acoustical tile, the supporting wood framework, the coffer troughs, wireways, auxiliary equipment, lamps, wire, switches and about 200 ft. of feeder cable. The rearrangement of the old sprinkler system, so that a sprinkler head is both below and above the false ceiling, cost about 11 cents per square foot.

CONSTRUCTION details of ceiling and troughs

APPROXIMATELY 85-ft. candles on horizontal working plane

STARTING the pay-out from the first reel section

Cross Nantucket Sound With Five-Mile Cable

Longest high-voltage, paper-insulated, submarine cable yet constructed, five sections of a mile each, prejoined to make a continuous length, brings high-line service to Martha's Vineyard

MANUFACTURE, transportation and laying of a power service cable from Falmouth on Cape Cod across Nantucket Sound to Martha's Vineyard constitute a new chapter in engineering, a variety of conditions having been successfully met by the time the cable was installed on July 22, this year. The installation augments the famous resort's power supply, previously obtained only through a 1,625-kw. Diesel-electric station on the island, with a direct connection to the steam power plant of the New England Gas & Electric Association at New Bedford.

A requirement that the cable be laid in one continuous length called for carefully planned co-ordination between the manufacturer and the utility company. The success of their combined efforts was demonstrated four days after the job was completed when the cable was subjected to a five-minute kenotron test of 65,000 volts between conductors and sheath, with entirely satisfactory results. Prior to the installation the cable was tested in one-mile sections with 60,000 volts a.c. and the full continuous length of 26,000 ft. with four joints at 115,000 volts d.c. Inspections were conducted by the Electrical Testing Laboratories and all A.E.I.C. requirements were fulfilled. The cable is now in regular operation.

Manufacture and Design

The cable was manufactured at the new Habirshaw cable plant of the Phelps Dodge Copper Products Corporation at Yonkers, N. Y., where tidewater shipping docks facilitated barge transportation of the 420,000-lb. load, made up of the cable, splices and a specially built steel reel and stands. It is of the three-conductor shielded paper-insulated type. The conductor size is No. 2 Awg. and the insulation consists of 20/64 in. of impregnated paper inclosed in a 3-mil perforated copper shield with intercalated paper. The three round conductors with paper fillers are inclosed in a 5-mil bronze binder tape with intercalated paper and a 9/64-in. lead sheath. Armor consists of No. 4 Bwg. galvanized steel wires laid on a bedding of two layers of asphalted jute and covered with one layer of asphalted jute. The finished cable has a diameter of 3¼ in. and weighs 14½ lb. per foot. The insulation thickness, which gives the cable a rating of 5,000 volts in excess of its 23,000 operating voltage, was adopted in view of the use of Peter-

A JOINT goes overboard

sen coils in the neutral of the system to which the cable is connected. The cable was made in five sections of approximately one mile each, a length determined by convenience of handling in manufacture, but the sections were joined by heavily reinforced splices at the Habirshaw plant before the cable was wound onto the giant reel at the shipping dock.

Double Sleeved Joint

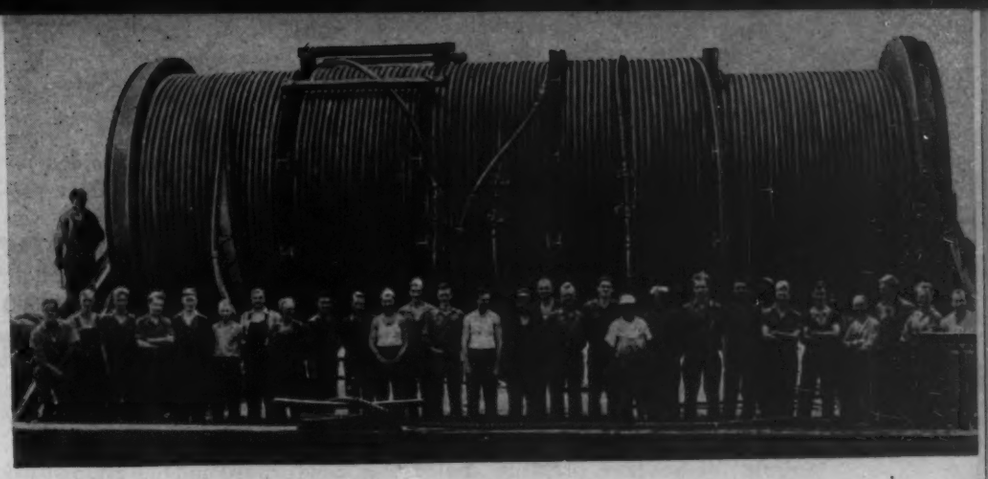
Design of joint adopted was the result of a study of joints used in previous installations and of the conditions peculiar to this installation. Electrical features followed familiar standards, the insulation being stepped up, built up with bias-cut varnished cambric and shielded with copper braid. Oil insoluble compound of the plastic type was used and the lead sleeve wiped to the cable sheath. Over this sleeve was a second sleeve, lead-burned to the sheath and filled with low melting point plastic compound. Burning was used, as it involved less heating and, therefore, less chance of loosening the wipes of the first sleeve.

Continuity of mechanical stress through the armor wires was assured by four steel rods, surrounding the joint sleeves and bolted to steel plates, between a pair of which the armor wires were clamped. A third plate, bolted to the first two, served to clamp another set of armor wires, 6 ft. long, used as stiffeners to prevent undue bending of the cable at the ends of the joint. Over all was a steel cylinder screwed into cast steel end cones, with infolded flanges centering it on the cable.

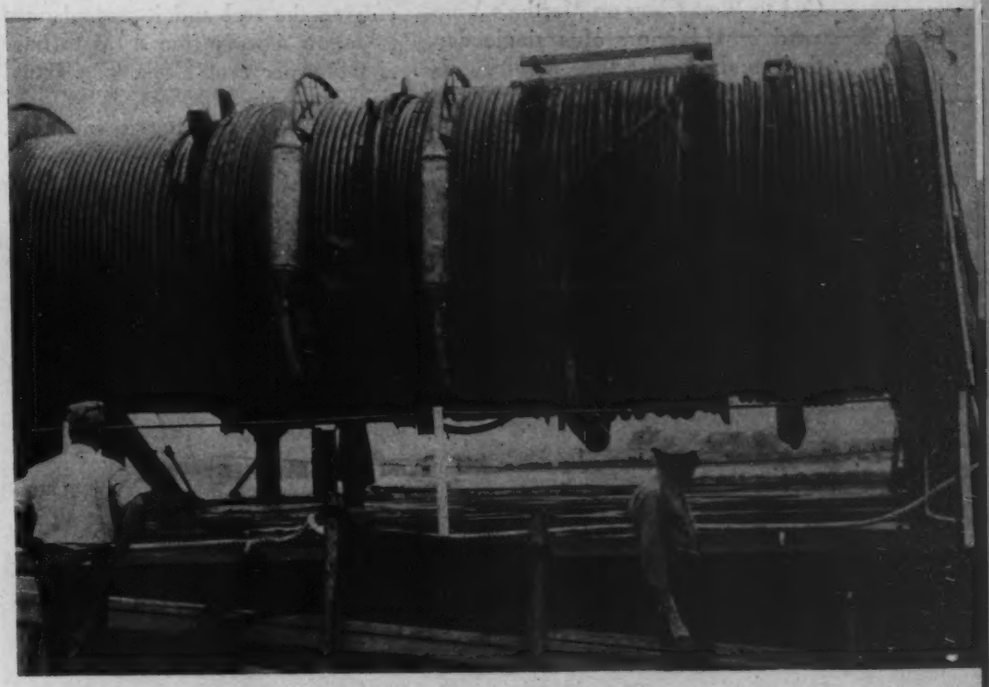
And the Biggest Cable Reel

The shipping reel, built by the New York Engineering Company of Yonkers, and assembled and welded on the reinforced deck of the barge at the Habirshaw plant, was 36 ft. long, of 8 ft. drum diameter and 14 ft. flange diameter. It was divided into five compartments, by means of which the tail end of each cable section, with its 600-lb. joint, was brought to the top layer.

Steel inclines led the cable over the spokes separating one compartment from the next and down to the drum to start a new section. Creep, which causes loosening of the cable in winding and tightening in unwinding, was practically eliminated by the

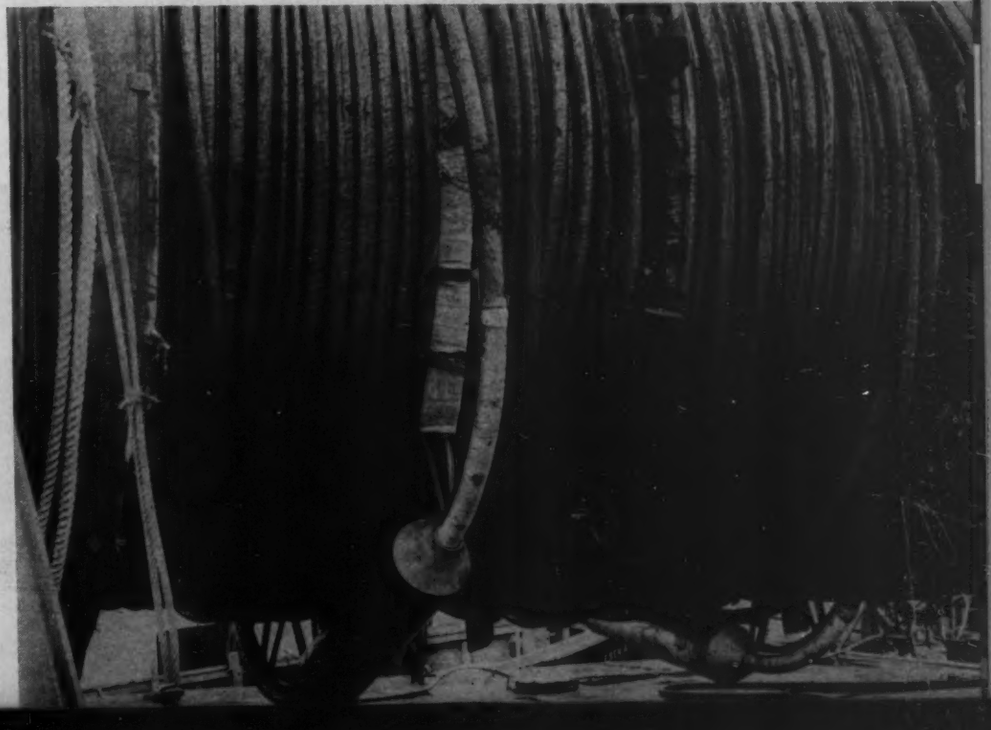


CABLE on reel ready for laying



JOINTS connect outer end of cable in one section to inner end of next

DETAILS of joints—note curved inclines holding joints from bending strain



use of the reel compartment idea and the locking of each section to its own compartment by grips. Joints were supported between curved steel inclines on which the contiguous reinforced cable armor rested. The inclines rested freely on the cable beneath and were free to slide. The joints, after being mounted on their inclines, were held in place by grips, pelican hooks and turnbuckles.

Installation

The cable was installed across Nantucket Sound from Falmouth on Cape Cod to West Chop on Martha's Vineyard in 11½ hours of a single day, the actual crossing time requiring 7½ hours. A U.S. Geodetic Survey polyconic projection map of the site, prepared under the direction of Lieut. R. R. Moore, showed a number of prominent landmarks on each shore and buoy locations at 1,000-ft. intervals along the route of the cable. By the use of this map, a three-leg projector and sextants the buoys were set in their proper locations. They each consisted of a 10-gal. oil can with pole and flag, anchored to a 100- to 200-lb. iron block by a line of length twice the depth. The greatest depth measured was 87 ft.

The swift current through Nantucket Sound made it desirable to lay the cable by a rapid continuous method, this being made possible by the reel and the pre-splicing. Avoidance of alternations of torsion which the "figure eight" method of laying would impose on the cable also prompted the decision to lay from the reel.

The barge, from which laying operations began about 1,200 ft. off shore at Falmouth, was about 330 ft. long and 47 ft. beam. A ¾-in. line was used to draw in a 5-in. rope (1⅝ in. diameter), by means of which, using a winch on shore, the barge was drawn to within 450 ft. of the shore, where it was anchored. The ¾-in. line subsequently was employed to pull a steel rope from shore to barge. This was used to pull the cable from barge to shore.

There was a large manhole or vault near the shore with an iron pipe running into the water as a protection against ice drift. The steel rope was threaded through this pipe and the cable drawn through. Dragging over rocks and embedding in sand near shore were avoided by carrying the cable over a float provided with rollers. The cable was not anchored, but about 20 ft. of slack was provided in the manhole where connection was made to 9,600 ft. of buried cable running to a substation.

In the main laying operation the barge was pushed, broadside on, by a pair of 1,000-hp. Diesel-electric tugs, one forward and one aft, assisted by a third tug of less powerful build but parallel with the barge bucking the current. Cable was paid out by means of a pair of donkey engines revolving the reel and it was planned to follow a wavy line so as to have about 4 per cent slack. The actual slack was somewhat less.

Joints went overboard smoothly, the cables rode up and down the inclines without difficulty and there was no trouble from creep. The island end was first removed from the reel and laid on the deck of the barge by a gang of about 75 men, then transferred, in the same way, to the beach, where, after removal of surplus length, it was laid in a trench with board protection for a distance of about 800 ft. Protection against ice, at the shore, was obtained by laying the cable about 5 ft. deep. The cable ended on a cable terminal structure equipped with spreaders, potheads and Thyrite lightning arresters. A short wave radio was used for signaling between terminals.

Procedure of installation was laid out by E. H. Steele, electrical engineer of the New England Gas & Electric Association, and executed under the direction of K. T. Folkenson of the E. M. Gilbert Engineering Corporation of Reading, Pa.

Resuscitation Performance

[*Continued from page 62*]

higher classifications were produced without sound standard technique; while almost none in the two lower groups were without defects.

There seemed to be a tendency toward heavy pressures, few realizing that so little effort was actually required to produce adequate ventilation. Swinging forward too far in applying the pressure was generally responsible for the excess. But in quite a few cases muscles of arms and back were brought into play.

Timing defects were the most common, mainly below the minimum requirement of twelve per minute, although quite a few exceeded the upper limit of fifteen. There seemed little basis for the belief that a fast operator would slow to normal as he tires. In many cases the last minute showed a faster rate, even when the entire chart was within acceptable limits. Peculiarly, the slow operators did not show this tendency, but seemed to become slower as the tests progressed.

Rhythm variations have a surprisingly strong influence on effectiveness. Some operators released pressure before an adequate quantity of air could flow from the lungs. There is a definite period during which the pressure should be maintained to secure proper expulsion of air. A momentary pause at the top of the forward swing, before releasing the pressure, frequently increased the ventilation 50 to 100 per cent. Pressure periods that were too brief probably caused most of the ineffectiveness found. These short pressure periods are usually accompanied with a long rest period back on the heels, to keep timing in normal limits. Many patients found the rest periods between exhalations were uncomfortably long. Inadequate ventilation because of the short pressure periods and long rests soon gave rise to a breathlessness that the patient could not endure and he was obliged to breathe unaided.

Can't Relax

A number of individuals had difficulty in relaxing as patients. Usually a little coaching eliminated the tension when the pressure applied was reduced to tolerable levels. It seems that at 60 lb. the muscles begin to tighten to prevent bodily injury, while around 80 lb. they become "locked" in their effort to support the stress. There were some persons who "locked up" at 40 lb. About 5 per cent were unsatisfactory as patients and needed substitutes; nothing that could be done would overcome their tension.

We are convinced that the tests have a value far beyond their costs and plan to make them annually. Meantime, practice sessions will center in the defects revealed in the tests.

Small, Antiquated Hydro Salvaged for Modest Outlay

Tailrace deepened, eroded dam recrested, building remodeled, station made automatic, new equipment installed — New penstock, new intake and headgate resuscitate 1,000-kw. development and cheat the scrap pile

W. G. FIELDER,* Central New York Power Corporation, Syracuse

GIVEN two 40-year-old, antiquated and decrepit hydro-electric power plants, what should be done with them? The scrap pile is one answer, but, on the other hand, the river still flows, the dam still creates a waterfall, and certain other parts of the development still have useful life in them. The High Falls plant of the Central New York Power Corporation presented just this problem last year. The old development was in two plants, one on each side of the river, each developing 400 kw. The generators were two phase and in bad condition. The waterwheels were shut down because of mechanical failures. Our answer to this problem was to rebuild, making continued use of the dam, one intake structure and headgate, one pipe and one power house building. New, full automatic equipment was installed and a new tailrace excavated.

Dam—crest cut down—forms for new crest taking shape

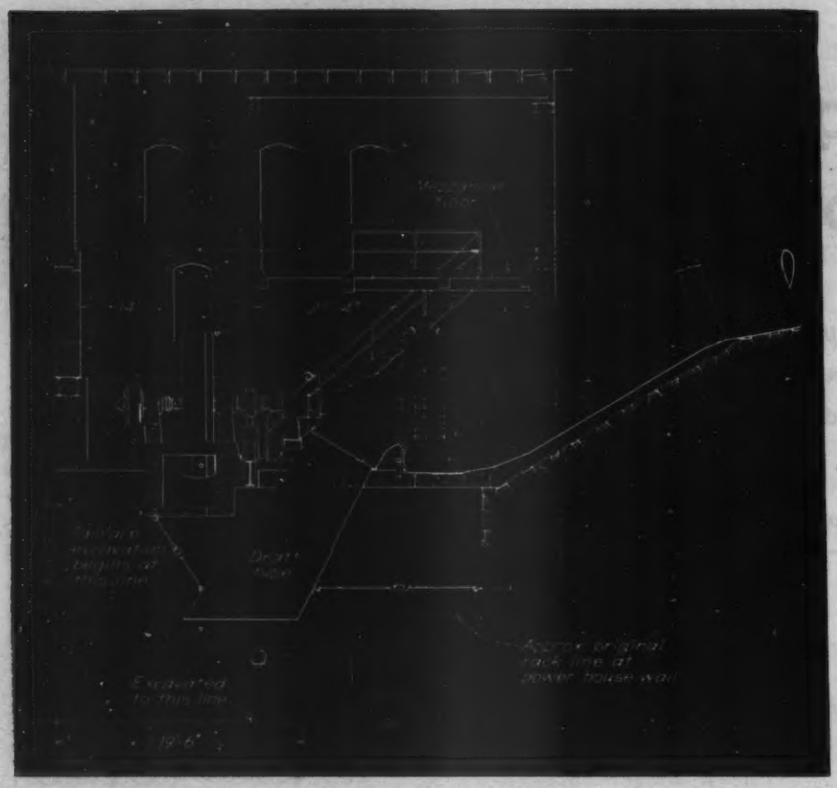
Dam—before any work was done

General Rehabilitation

The main features of work involved, outside of new equipment, consisted of the following:

The crest of the dam was found badly eroded, so it was cut down to good concrete and a new reinforced crest of about 4 ft. thickness was poured, the new concrete being carefully tied in to the old. New steel trash racks were found necessary. The power house building was totally unsuited for the new equipment and was, therefore, demolished except for the four walls and the roof. A new main floor was added to carry the

*Hydraulic engineer.



Longitudinal section through power house

turbine and generator and a mezzanine floor to carry the switchboard, the bus structure and the station battery. The old tailrace was enlarged and deepened, a job involving 1,300 cu.yd. of solid rock excavation. On account of the location of the tailrace in the deep river gorge, rock removal, after blasting, was all hand labor.

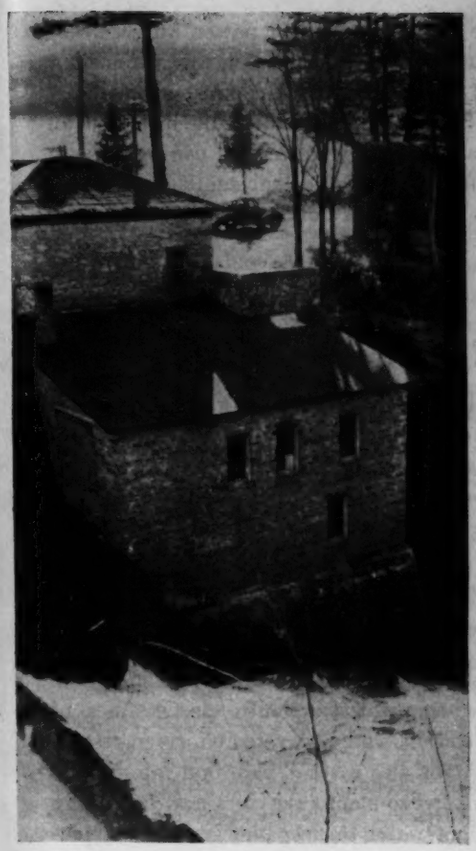
New equipment consisted of a single, horizontal (S. Morgan Smith) waterwheel of 1,400 hp. capacity; a three-phase, 60-cycle, 2,400-volt horizontal (General Electric) generator of 1,000 kw., 0.8-power factor capacity; a direct-connected exciter, and switchboard and bus structure for full automatic operation. Since the plant will be visited by an attendant only on routine inspection trips, protective devices were generously used to safeguard the plant. These protective devices include:

Reverse phase protection, bearing temperature relays, generator winding thermal relays, generator overspeed relay, generator differential protection, generator overvoltage and undervoltage relays, generator overcurrent relays, generator field failure relay, governor oil pressure failure relay. Certain relays are wired through an annunciator located at the plant, to give indication of the location of any trouble resulting in a plant shutdown. The annunciator also indicates undervoltage on the d.c. control bus and undercurrent on the battery charger. Control wiring and all protective devices are supplied with direct current from a 48-volt storage battery in the plant.

Float Control

The plant will normally operate under float control, running at the best over-all efficiency point until the pond is drawn down one foot, then motoring while the pond fills up. While motoring, the draft tube of the waterwheel will be unwatered with an automatic vacuum breaker. The plant will start itself if tripped off the line due to trouble outside the plant after the trouble is cleared and service has been restored on the line. The plant will stay shut down until an operator arrives if taken off by the

General layout of plants (power house No. 1 contains new unit)



Power house before alterations

Tailrace excavation—looking downstream

Tailrace, power house—looking upstream

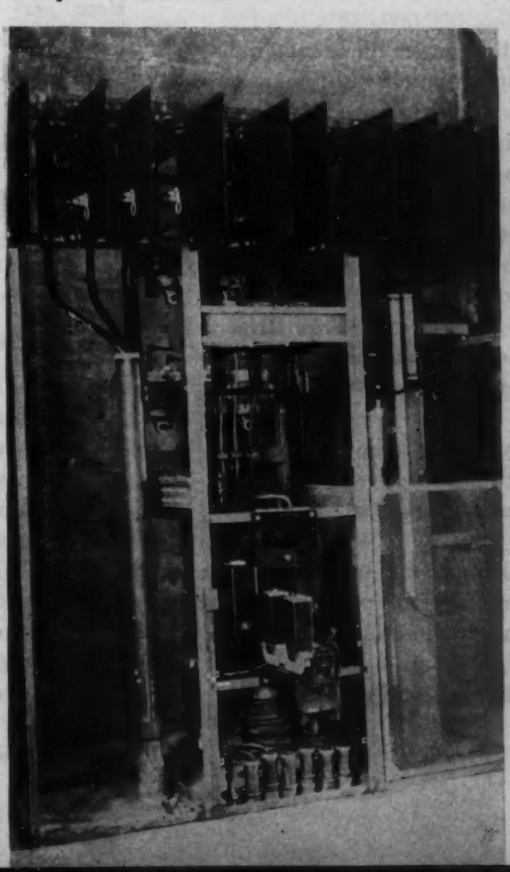
protective devices at the plant. An alarm system is installed to notify an operator if the plant shuts down. This alarm system operates over telephone wires, giving a code call at two nearby power plants and at the operator's home. The operator has to come to the plant to find out the particular protective device that shut the plant down.

Response to Frequency Drop

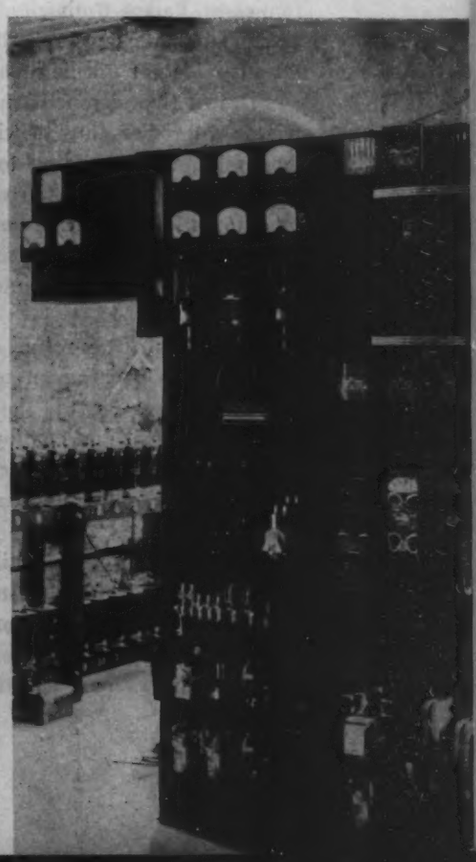
If, for any reason, the system frequency falls below normal, the plant will start generating regardless of pond elevation and continue to generate until normal frequency is again established or until the pond is drawn to the point where air is being drawn down the pipeline. This feature was added because this plant (in connection with two others) supplies a relatively small area connected to the main system with a single transmission line, a failure of which might cause an outage on several small towns.

The net result of this reconstruction work was the addition of 1,000 kw. of capacity to the system and an annual output of some 6,500,000 kw.-hr. The total cost of the reconstruction, including equipment, amounted to about $70,000, in spite of winter conditions throughout the entire time of the construction period.

Factory-built bus structure



New switchboard



Editorials

S. B. WILLIAMS, *Editor*

McNary on Power

SITTING in an Indianapolis lunchroom, Wendell Willkie listened to the acceptance speech of his running mate, Charles McNary.

"I see no substantial difference between Senator McNary's views on public power and my own," was his reply when questioned about the vice-presidential candidate's statement of position on that matter.

Mr. McNary had said that power produced from navigable streams was a common heritage and that,

"The government, having made this power available, should have an indisputable right to control its utilization and distribution. Maximum benefits for domestic consumers, farmers and small users of power should be the yardstick by which we measure the usefulness and serviceability of every federal development. Moreover, rates should be maintained at the lowest level consistent with sound amortization. Where irreconcilable conflicts arise between public and private interests in the development and distribution of power, private holdings should not be confiscated, and we now have a working precedent for such fair treatment in the recent acquisition by purchase of private companies by the Tennessee Valley Authority."

In his statements regarding power, the Senator did not advocate nor did he identify himself with:

Destructive competition between government and private enterprise, thus to wipe out investments made in good faith and according to law.

Continuous and perverted propaganda aimed toward the elimination of private enterprise.

Strong-arm political methods designed to force communities and regions into acceptance of government ownership.

Free gifts of tax-raised and tax-backed money used to bribe local government units into embarking in the power business.

Appointment and employment in policy-making and operational positions in government power undertakings of men whose only qualification is violent hostility to private enterprise.

Vilification of electric utility men and business organizations with the object of making it appear that these men and organizations are engaged in criminal and anti-social activities.

From these and from other acts and attitudes of the New Deal in the matter of electric power Mr. McNary kept himself clear in his speech of acceptance. Considering this fact and considering the forthright and definite quality of what he did say, electric utility men and all believers in private enterprise in general can agree with Mr. Willkie that they see no substantial difference between the vice-presidential nominee's views and their own.

"Fiahwood foh de Wintah"

WHEN the wind had died down and the rain had stopped people came out to look at the damage done by the storm that cut a wide swath in the southeastern states a few weeks ago. Through the exclamations of amazement and dismay at the sight of broken trees, of fallen wires and of structures rent and torn by the fury of the wind there came a note of philosophic cheerfulness. An old negro spoke. He said: "De Lawd done sent me fiahwood foh de wintah."

In the August 24 issue of ELECTRICAL WORLD a news story tells of the storm, of destruction to electric lines, of damage to power stations and of devoted efforts to restore service. The story tells also of the "fiahwood foh de wintah" in the form of hydro-plant reservoirs now brimming with water, sufficient water to keep the generators spinning for a long time.

But there is more "fiahwood" than just water in the reservoirs to be gathered by the electric utilities as a result of this storm. There is the warmly burning firewood of friendship and appreciation that follows service quickly and completely performed. Out of the experiences of the storm there are stored in the minds of customers memories of the valiant work of utility men in restoring service, thus keeping the faith reposed in them.

Here was the fine, spectacular occasion when utility service is actually seen in impressive terms, a striking change from service accepted without thought and having no more pleasant reminder than the monthly bill. It will be well worth while for the utilities concerned to gather every stick of this firewood and to use it intelligently in keeping warm the feelings of their public toward them.

Transformer Temperatures

TIE LINES and industrial feeders are now pretty sure to experience, here and there, loads that will temporarily tax the capacities of the associated power transformers. Every one knows that overheating shortens life, but that realization is no complete alibi against carrying the load. The question is how much is the overheating an emergency condition.

With so much recent discussion of transformer temperatures and so much written into the standards one would expect to see every important transformer provided with some form of temperature-responsive indicator.

Mark Twain used to ask why, if the weather was so important, didn't somebody do something about it.

Probably the reason why more units are not so equipped is because the performance expected of these devices is not at all simple. Basically they must present a temperature response that reproduces the temperature rise of hot spot areas of the windings above that of the oil. There are several ways of attempting the duplication of thermal behavior within the transformer, but, it appears from the discussions of the operators, some are "not as good as they could be and few are ever likely to be as good as they should be."

Few expect high precision in such an instrument. All that is asked for is a reliable load-to-temperature guide. The economics of transformer loading and transformer life would seem to offer a margin of saving (through prolonged life along with sustained revenue loading) which should be able to justify a moderately expensive device. It must be rugged, consistent in its indications and of such positive response that the operators will have faith in it and be willing to follow loading instructions predicted on it. As long as such loading instructions have to be conservative there is a loading margin that is being sacrificed.

More general availability and use of indicators of encroachment on thermal loading limits would seem to be a timely move under present rising loads.

Pills — and Pills

UTILITY MEN who talk about persecution by government regulatory agencies—who talk mostly among themselves because they fear a heavier hand if they speak their complaints too openly and too loudly—may today be forgiven a small grin or even an audible snigger.

The cause for this gentle mirth is that ancient figure of fun, the doctor who is forced to swallow his own medicine.

No more bitter pills have been prescribed by the Securities and Exchange Commission for any holding company than the large and acrid boluses shoved upon the Associated Gas & Electric group. Whether or not the patient needed such medication is beside the present point; the fact is that the commission apparently employed all the resources of its legal pharmacopeia, all the legal gall and wormwood, rue, quassia, aloes, asafœtida and hemlock, to compound the medicine for Associated. It was just lots of fun—for the doctor.

But the patient died; that is, died as a solvent concern. Then it was resuscitated in a trusteeship with New Dealers in command. Now, if ever, a holding company organization would be properly and honestly administered. But, strange to relate, it was not long before the SEC decided that additional medicine was necessary; the doctor wrote another prescription. But did the patient swallow the pill without protest? Not he. He yelled long and loud.

"Persecution," shouted Walter H. Pollak, one of Associated's New Dealer trustees, when the SEC imposed certain conditions on the use of $200,000 sought to be obtained from the sale of obligations of the holding company. Such conditions on use of money and other interferences in management are no new thing to the long-suffering utility man. But it is new and funny to him to see the doctors who pushed such medicine down his throat now protesting violently against swallowing it themselves.

Falling Water and Burning Coal

OF LATE MONTHS there has been little heard of the arguments and evidence by which engineers and others have striven to set before the people the facts of electric power costs, specifically the fact that there is no inherent advantage of low cost in the production of electricity from water power. Under the pressure of more urgent problems of engineering and business arising from the necessity for adequate national defense, consideration of the economic merits of production of electricity from falling water as against production from burning fuel has been pushed into the background of men's minds.

Yet the question persists and it will not be downed. After all, economy and business sanity cannot be entirely abandoned, even in times like the present. We have not yet reached the condition of emergency in which we must give no thought to costs. And although effort has largely ceased to convince the public and the politician that fuel power electricity is generally cheaper, yet when it comes to planning for new industrial capacity the comparative cost of electricity from fuel as against the price asked for electricity generated by water power remains a matter for studied consideration.

According to a recently published news item, the Reynolds Metals Company of Richmond, Va., had planned to build a $15,000,000 aluminum plant in northern Alabama, using TVA power. The news story, dated August 26, relates that:

"M. M. Caskie, vice-president of the company, said the cost of generating power with a coal-burning plant was being studied. The decision, he said, would be based on how that figure compared with rates offered by the Tennessee Valley Authority."

Here is an industrial process which makes extremely large and long-hour use of electricity and in which, obviously, the cost of electricity is a tremendously important factor. It has almost been conceded that in aluminum production water power has the edge over fuel power. Yet we find that the asserted cheapness of water power is being seriously questioned in this case, even as regards that paradise of cheap power, the TVA region. Whether the Reynolds Metals Company decides to buy TVA water power electricity or to generate its energy requirements in its own steam power plant is of no moment in the discussion here. The point is that when it comes to consideration of economy in an industrial operation it takes more than a popularly accepted idea to prove that water power is cheaper than fuel power.

Masking the Real Purpose

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

WHAT could sound fairer than that the government should have the power, in a time of national danger, to take over *any* productive capacity necessary to defense the private owners of which refused to co-operate with their government in its hour of need?

Most of us would be willing to go a lot further than that, and in many directions, in order to make sure that this country should be ready if war is forced upon us. There are some who would have been delighted, for example, to have had the government commandeer the plant of Henry Ford, a little while back, so that its productive capacity could have been used to make airplane engines for Britain. Those wanting to go this far, of course, are the folks who believe that the Battle of Britain is the last step before the Battle of America on the Hitler schedule. And there are quite a few people who believe that passionately, as evidenced by the recent Gallup poll showing a large majority favoring giving Britain the 50 destroyers.

So when Wendell Willkie attacked the Overton-Russell amendment, which provided for the commandeering of private plants by the government, and called upon the President to state his view on this issue, there was distress among some of Willkie's stanchest supporters. For example, Walter Lippman and Raymond Clapper.

Loose Talk

But let's look at this thing coldly, first with a view to determining if it is really necessary, and second what use the Administration will make of this power.

There has been a lot of loose talk about industry, eager for big war profits, holding up the defense program. In fairness it must be admitted that none of this has originated at the White House. On the contrary, the President, on the eve of the Senate's vote on this amendment, told the newspaper men that the Defense Commission reported to him that business was co-operating splendidly, and he added that the commission ought to know!

Yet the public had been getting a very different impression. It had been reading about manufacturers waiting to find out what the taxes were going to be—what the government would allow them to charge off in amortization of plant. Some of the speeches in Congress, played under big headlines throughout the country, made Benedict Arnold sound like a Nathan Hale as compared to our greedy would-be war profiteers.

But It Isn't So

The simple fact is that, almost without exception, all of this waiting to see what Congress would do about taxes was confined to *proposed* plants—not existing plants. It was not a question of refusing to operate existing plants unless the government guaranteed huge profits, it was a question of not building new plants which might operate for one year, or three, and then become stark and idle under some new international disarmament scheme, in which case the investors in that new plant would lose their shirts.

Now it is very simple for the government to commandeer an *existing* plant, but it is a bit difficult to commandeer one for which even the blueprints have not been drawn. And according to all of the evidence in the hands of the President and the Defense Commission, there is no need for either, because business is cooperating.

The truth is that any number of concerns are building new plants and risking the shirts of their stockholders without waiting to see what the taxes and amortization rules are going to be.

It is rather interesting in this connection that the President has stated over the radio that only *one* man on whom he had called for patriotic service had declined to serve. It is also interesting to figure on the merits of this case. As has since transpired, the man was Roy Howard, for many years head of the United Press and the Scripps Howard newspapers.

Now the President did not ask Mr. Howard to build an airplane factory. He asked him to go to South America for a propaganda job. It so happened that Mr. Howard very definitely believed himself unfitted for this particular assignment. He also believed that he could recommend several men who could do it better than he could. Several editorial writers with other organizations have bluntly stated that the President wanted to enlist Howard not because he thought Howard was the ideal man for this job, but because of the effect on the editorial policies of Howard's newspapers.

Be that as it may, the White House virtually held Howard up as a slacker for refusing to do something that Howard thought would be unwise.

Now apply all this to the electric industry! Remember all the chatter from New Deal sources about a power shortage? Remember the grid system in the Northeast which was alleged to be so vital to national defense? And have you noticed that every time a big new defense appropriation bill is passed there is always a blank check included for the President to use in any way he sees fit?

No Logic in It

Of course it happens to be true that the Administration's avowed policy is to establish the new national defense plants well back from the coast, and it also happens that the only spot which any one has ever been able to get New Dealers to mention as a bit weak on power supply is at one of the Atlantic ports. But logic seldom bothers the Administration in dealing with any problem involving electric power.

Especially if logic would interfere with the New Deal's irresistible urge to spread the "blessings" of government ownership of the electric industry throughout the land!

NEWS OF THE WEEK

TVA Project Dedicated by President Roosevelt

Labor Day exercises at Chickamauga Dam witnessed by 50,000 — President says seven Southern states are receiving benefits from the government's socialized power project

Dedicating Chickamauga Dam, the newest power development of the Tennessee Valley Authority, President Roosevelt heaped praise on the government's socialized power project as an important link in national defense. With a crowd of more than 50,000 visitors present, the President said that the benefits of the TVA program are being shared by seven Southern states.

At the Labor Day exercises Mr. Roosevelt said that "it is appropriate that we recognize this signal achievement on the day when the whole nation pays tribute to labor's contribution to the democracy which we are now preparing to defend." He declared that Chickamauga Dam and all the TVA dams stand as a monument to a productive partnership between management and labor, between citizens of all kinds working together in the public weal.

Great Achievement

Indirectly the President took a thrust at his Republican presidential opponent, Wendell L. Willkie, when he asserted that "there were and are those who maintain that the development of this enterprise that lies largely in this state is not a proper activity of government. As for me," Mr. Roosevelt said, "I glory in it as one of the great social and economic achievements of the United States."

Already, and several years ahead of "our carefully planned schedule," the President declared, "we are creating new plants which of necessity will use more power. I am glad, indeed, that in spite of partisan opposition, the Congress of the United States has overwhelmingly voted the necessary funds. That money is now at work."

Mr. Roosevelt dedicated the dam and the lakes to the benefit of all the people, "the prosperity they have stimulated, the faith they have justified, the hope they have inspired, the hearts that they encourage—the total defense of the United States of America."

President Roosevelt had journeyed from his home in Hyde Park, N. Y., to dedicate the TVA development, and later in the day dedicated the Great Smoky Mountains National Park in an address at Newfound Gap, Tenn.

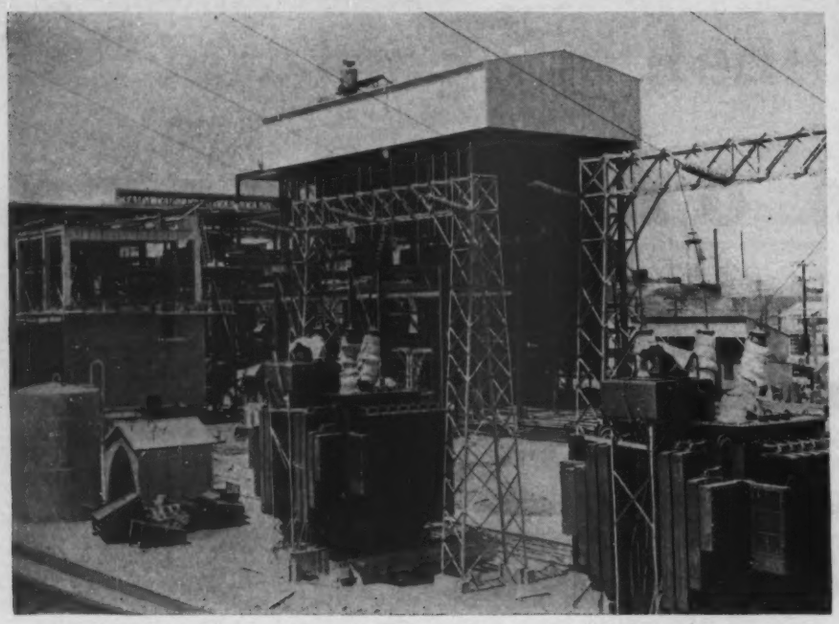
Wide World

DEDICATES DAM—A general view of the large crowd which gathered at Chattanooga, Tenn., Labor Day as President Franklin D. Roosevelt made his address dedicating Chickamauga Dam, the newest hydro-electric project of the Tennessee Valley Authority

Detroit Edison Gets Stay of SEC Order

Efforts of the Securities and Exchange Commission to bring Detroit Edison Co. under its jurisdiction and to have its order declaring the Detroit utility to be a subsidiary of North American Co. made effective have met with stern opposition.

Detroit Edison petitioned the court on August 22 for an order temporarily staying the SEC decision and last week Judge Herschel W. Arant of the United



STEAM STATION—General view of the eastern end of the Martinez steam plant, one of three 50,000-kw. plants of Pacific Gas & Electric at oil refineries. This is part of the three-year program. The company has a $15,500,000 budget for 1940

States Circuit Court of Appeals at Columbus, Ohio, granted the order.

The order provided that the commission's decision shall not become effective until the Circuit Court determines whether a permanent stay shall be granted. The full court will convene in Cincinnati on September 27.

North American Co. owns 19.28 per cent of Detroit Edison's outstanding capital stock, but the Detroit utility maintains that it is not a part of the holding company system and is completely independent of parent concern management.

•

G. E. Employees Services Pledged to U. S. Defense

President Charles E. Wilson of the General Electric Co. pledged the support and services of the company's 86,000 employees to the national defense program in a Labor Day greeting to labor on Sunday evening, September 1. Mr. Wilson spoke on a coast-to-coast National Broadcasting Co. network as part of the "Hour of Charm" program sponsored by the General Electric lamp division.

He recalled the peace-time contributions of G.E. workers to American life. "As loyal and conscientious citizens," he said, "they have a firm faith in democracy, freedom and the right—and as artisans they are applying the full force of their energies and the full scope of their skills to the speedy production of many of the types of complicated equipment required on land, at sea and in the air for the effective defense of the way of life on which their faith is founded."

•

REA Attack Against Utility Held Unjust

Slattery Praises Carolina Utility for Co-operation With Projects

Harry Slattery, REA Administrator, has sent a letter to REA co-operatives at Wake Forest, Goldsboro, Raeford and Stedman, North Carolina, stating that his charges against Carolina Power & Light Co. were "unjust" to the utility and "needless to say, I greatly regret that they were made."

Mr. Slattery had charged that the utility had constructed a 6-mile "spite line" in Hoke County. This the utility denied. Mr. Slattery said that his charge was based on reports of field representatives "and appeared to be substantiated by an examination of our files in Washington." However, Mr. Slattery said he sent a special representative to investigate the conditions and found that his earlier message "was not based on present facts." He said that the utility has lately followed a policy of co-operation with REA-financed co-operatives which "I wish all power companies would adopt."

The Carolina Power & Light Co. has continued its policy of active co-operation without change, Mr. Slattery said. "For this I want to express my sincere thanks."

Pacific Coast Utility Has Adequate Power

Pacific Gas & Electric Co. is well prepared to meet any additional demands upon its facilities in connection with the accelerated program of national defense, according to James B. Black, president, in a report to stockholders.

Mr. Black said that construction of the new 50,000-kw. steam-electric generating station at Avon, located on the shores of San Francisco Bay in Contra Costa County, is rapidly approaching completion. A similar unit now being installed at Martinez, in the same general vicinity, will be ready for operation in the next few months, and a third plant of like capacity at Oleum will be completed in 1941. In the following year an additional 75,000 kw. of capacity from the Southern California Edison Co. will be available to Pacific Gas & Electric.

The management in recent weeks has been actively engaged, with representatives of the city and county of San Francisco, in an effort to find a satisfactory solution of problems created by the decision of the United States Supreme Court in holding that the existing agency contract for the distribution by the company of power from the city's Hetch Hetchy system does not comply with terms of the Raker Act.

•

Connecticut Power to Finance New Unit

Connecticut Power Co. will undertake immediately the financing of new plant construction through a new bond issue, to which stockholders will have the first opportunity to subscribe.

The Connecticut utility will install a new 25,000-kw. steam turbine at Stamford, which, with all corollary facilities, will cost about $4,000,000.

Stockholders will be offered rights to subscribe for the new bonds on the basis of one $500 bond for each 83 shares held.

•

Nashville "Birthday" Drive

The Nashville Electric Service, co-operating with 140 local electrical appliance retailers, has launched a six-week "Birthday Campaign" to promote greater use of electric water heaters, refrigerators, ranges and other heavy use appliances in the Nashville area. The NES will aid retailers by sales promotion. All sales during the drive will be made through regular retailers.

Engineers Urged to Take Part in National Affairs

A.I.E.E. President Sorensen at Pacific Coast meeting outlines three-point program to enlarge field of activity — More than 450 delegates gather at Los Angeles convention

"We must prepare ourselves to meet armed invasion with armed defense, and the electrical engineer must do his part."

That message was delivered to the Pacific Coast convention of the American Institute of Electrical Engineers last week by the Institute's national president, R. W. Sorensen of California Institute of Technology. Dr. Sorensen was opening speaker at the meeting, which drew 451 delegates to Los Angeles' Ambassador Hotel.

Enlarging upon this theme, Dr. Sorensen said: "The engineer set up our first line of defense when he invented the cotton gin. He did so by pioneering a higher standard of living. The engineer of today must carry forward that pioneering spirit, but he can no longer confine himself to his work alone."

Three-Point Plan

Mr. Sorensen urged engineers to enlarge their field and help carry engineering method into our daily lives and into government. He set forth a three-point program: (1) For engineers, first of all, to continue doing their own job well; (2) to exert their influence toward stopping government interference, and (3) to enlarge their field of activities in community life.

Following Mr. Sorensen's address, convention chairman N. B. Hinson, who is chief engineer of Southern California Edison Company, introduced Douglas Shearer, sound director of Metro-Goldwyn-Mayer studios, who told about some of the electrical aspects of motion-picture production. To indicate the scope of a studio's electrical problem, he described one motion-picture set in which 40,000 amp. at 120 volts d.c. was required for lighting alone. M-G-M, he said, purchases 21,000,000 kw.-hr. per year.

The technical meetings, lasting three days, followed a program set up by a committee under J. H. Vivian of Southern California Edison. Successive sessions dealt with protective devices, power transmission and distribution, electrical machinery, instruments and basic sciences, and communications.

Members of the Institute of Radio Engineers joined with the A.I.E.E. for a joint session on communication, which featured a series of discussions on frequency-modulated radio. Major E. H. Armstrong of Columbia University gave the initial address.

He outlined the development of frequency-modulated equipment to the point where standard receivers may now be purchased from at least three manufacturers and described the progress of frequency-modulated stations in New England which are scheduled for broadcasting on a commercial scale. Mr. Armstrong said he visualizes an opportunity for small operators throughout the country to start a nation-wide chain of frequency-modulated stations by reason of the fact that clear signals may be produced on low-powered, hence low-cost, equipment.

Discussions indicated that several Western power systems, operating or contemplating two-way emergency radio systems of operating purposes, are giving serious consideration to adopting this type of equipment.

An ingenious development, one of several in the series of technical papers presented to the meeting, was that described by G. Leslie Hill of Pacific Gas & Electric. Described as a new type of power fuse, the device is one which has undergone perfection through seven years field tests on the P.G.&E. system.

It consists of two fuse elements of different rating, in series. On overcurrent, the lower-rated element melts first, drawing an arc. Energy from this arc is used to build up a pressure and force a sealing plug, establishing a second arc. Pressure in the tube then blasts an arc-extinguishing substance into the second arc and interrupts the circuit.

•

Install Transformer Bank at Waycross

An important substation addition was made by the Georgia Power & Light Co. recently at its Waycross substation. A new transformer bank was installed, consisting of four 200-kva. transformers, 2,300/6,900 volts, on a new steel structure. The Folkston-Nahunta 11-kv. line, which formerly ended at a small step-up station on the edge of Waycross, has been extended about 2 miles to the main station to connect to the new bank of transformers. The new bank and line are protected by an automatic reclosing circuit breaker.

The new transformer bank and line will provide capacity needed to serve

A.I.E.E. AT LOS ANGELES—Seen during the Pacific Coast meeting of the American Institute of Electric Engineers last week. l. to r.— C. J. Nevitt, San Diego Consolidated Gas & Electric; M. S. Barnes and Walter Smith of General Electric; H. C. Gardett, general manager of Los Angeles Bureau of Power & Light; Fred Doolittle, Southern California Edison; R. H. Halpenny, Nevada-California Electric, and Harry Kalb, Pacific Gas & Electric. More than 450 delegates attended the convention at the Ambassador Hotel

the lines of the Okefenokee Rural Electric Membership Corp., which will take service at Schlatterville, Nahunta and Folkston, to supply eventually 600 customers on 235 miles of line.

Besides the new business acquired, the company will benefit by improved service to present customers and capacity released in the Waycross distribution system.

•

South Carolina Power Supplies Standby Service

South Carolina Power Co. is constructing a power tapline and a substation to supply emergency standby service for the Charleston navy yard. The 3,000-kva. substation will be able to supply the normal operating needs of the yard in case of sabotage or if accident should cripple the plant. A permanent 5,000-kva. substation is projected for the near future.

The Charleston navy yard is spending more than $400,000 for new boilers and generators for its own power plant.

•

Carey Assumes New Duties

Charles E. Carey, chief consulting engineer of the Bonneville Power Administration, has assumed, in addition to his present duties, the post of assistant chief of the administration's system planning and marketing division headed by William A. Dittmer.

Power Factor Correction Ruled for Fluorescent

Wisconsin Public Service Commission prescribes uniform requirements for all types of gaseous tube lighting — Customer must install corrective equipment at own expense

The movement to require the correction of power factor of fluorescent lighting installations gained added momentum when the Public Service Commission of Wisconsin, bellwether of state utility commissions, handed down recently a uniform ruling requiring the correction of power factor on all such installations for illumination and advertising, at the owner's expense.

Customer Installation

Under the Wisconsin ruling, installations of fluorescent, neon, zeon and other hot or cold cathode gaseous tube lighting for illumination must be corrected to a power factor of at least 90 per cent lagging and installations for advertising to at least 85 per cent power factor lagging. The ruling gives Wisconsin utilities the right to refuse or discontinue service to any new installation that has not complied with the provisions.

In the opinion of the commission, "it is more feasible to have the customer install at his own expense such corrective equipment as is necessary for the reason that such provision will result in a saving in wiring and energy cost."

The commission designated as advertising tubing which contains a message showing a configuration of letters, numerals, characters or distinctive trademarks. However, it specifically excepts from correction any complete sign supplied from a single auxiliary transformer rated at 225 volt-amperes or under.

With respect to gaseous tube lighting installation for illumination, the rule requires maintenance "—at not less than 90 per cent, the power factor of each unit of such equipment or group of such equipment controlled as a unit by a single switch or its equivalent which controls only such unit."

The ruling of the commission becomes effective concurrently with the rules to be prescribed in a forthcoming revised standards of electric service for utilities in Wisconsin.

NEW ANGLE ON "HOME SERVICE"—A battery of 30 Westinghouse roasters is utilized by a veteran Pittsburgh restaurateur to prepare and deliver hot meals, roaster and all, for parties of four or more at private homes. "Roaster meals" are also delivered to picnics, hotel rooms, etc., and when desired by diners at the restaurant the roaster with meal is wheeled to the table

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Carolina Power & Light In Improvement Program

A program of installation of modern equipment to minimize loss of service due to storms or other causes has been undertaken by Carolina Power & Light Co., according to Charles S. Walters, vice-president.

Work is under way on some projects and plans are being completed for others to provide a general improvement in electric service for Asheville and rural lines in the section. Mr. Walters said that work now under way is for improvement of service in West Asheville, Emma, Candler, Hominy, Pole Creek and Beaverdam road. The one feeder serving these sections is being cut into three separate feeders.

•

Buzzards Roost Opens

Buzzards Roost power plant at Greenwood, S. C., has been placed in operation as the $5,000,000 PWA power project nears completion. The plant eventually will be linked with the Abbeville and Santee-Cooper projects in a chain skirting the southern border of the state.

Permits Co-operative to Use Franchises

The Choptank Co-operative, Inc., has been granted permission by the Maryland Public Service Commission to exercise franchises granted to it by the county commissioners of Dorchester, Queen Annes, Kent and Cecil counties, Md., and to begin construction of extensions in its system in these sections. The order of the commission, however, excepts the territory south of the Chestertown-Georgetown Road between the Chester River and the Chesapeake Bay.

Authority is granted provided there is no interference with the service of the Eastern Shore Public Service Co. of Maryland, Maryland Light & Power Co. and the Chestertown Electric Light & Power Co. of Kent County at points where the co-operative lines cross or come in close proximity to the existing lines of these companies or lines hereafter erected by any of these companies under commission authority.

The commission reserved its decision in regard to the territory south of the Chestertown-Georgetown Road between the Chester River and the Chesapeake Bay.

•

Dismisses $50,000 Suit Against Florida Utility

The $50,000 suit against Florida Power & Light Co. and North American Aviation Co., growing out of the wreck of an Eastern Air transport plane at Daytona Beach in August, 1937, has been dismissed in federal court.

The suit accused the power company of negligence in constructing during the night power poles near the Daytona Beach airport, against one of which the plane crashed in a take-off. The poles had been constructed to replace temporarily an underground conduit which had failed.

•

Georgia Power Sales

Merchandise sales of Georgia Power Co. for the first seven months this year totaled $1.624.687, an average of $8.88 per residential customer. Sales for July were $310,103, or $1.67 per residential customer.

•

May Not Use TVA Power

Reynolds Metal Co. of Richmond, Va., which proposes to erect a $15,000,000 aluminum plant in Alabama, may build its own steam-generating plant instead of using TVA power, according to reports. Attorney-General T. S. Lawson of Alabama has ruled that the steam plant if erected would come under the head of new industries and thus be exempt from taxation for ten years.

•

"Davit" Standards Light Amusement Park Area

Ocean Beach, celebrated amusement park of New London, Conn., rebuilt since the disastrous hurricane of September 21, 1938, is equipped with special lighting typified by the above Daunt tapered "Unitube" standard, from which depends a General Electric acorn design of luminaire housing a 200-watt lamp mounted 18 ft. above the roadway.

The "Theme Center" of the park is illuminated by Crouse-Hinds floodlights mounted on a clock tower, and a boardwalk 1,200 ft. long extending outward from this center in two directions is provided with twelve Daunt units normally spaced 100 ft. apart in a single row along one side of the way. The nautical tone given the standards adds to the decorative scheme of the park, which also employs cove lighting in special locations.

•

Utility Inquiry Muzzled

Federal District Judge Charles G. Briggle has signed an order prohibiting publication of the names of witnesses "or of their purported testimony before the grand jury" which is investigating financial operations of Union Electric Co. of Missouri and other utilities. The order had been sought by District Attorney Howard L. Doyle.

Rates Established for Shasta Energy

Price rates for Shasta Dam energy were disclosed August 29 by officials of the federal Reclamation Bureau after representatives of state and federal governments discussed their respective spheres in Shasta activity.

The federal government has set a competitive value of 4.28 mills per kilowatt-hour on Shasta power delivered at the proposed Antioch substation and 5.16 mills delivered to municipalities or districts which desire to buy it. A further price of 2.98 mills was fixed for power delivered at Shasta Dam.

Harvey F. McPhail, senior electrical engineer for the bureau, said the government intended to construct a $10,878,000 steam plant at Antioch in order to assure a 1,083,000,000-kw. volume of "firm" power at that point annually and 1,063,000,000 kw. at load centers.

On that basis, Mr. McPhail declared, the bureau estimates its power income from the project would be $7,202,000 annually, against $6,652,000 required for operation, maintenance, replacements and amortization of the share of the project cost allocated to power. This share was fixed at 40 per cent of the $103,000,000 estimated cost of Shasta Dam.

Representatives of the federal government stated that the minimum sale price of Shasta power is estimated at 8.2 per cent below competing commercial rates. Despite this estimate, Secretary Harold Ickes in a letter to the authority urged co-operation in the formation of municipal power districts to distribute this electricity.

•

Bonneville Tie-Line

With the completion of its high-voltage tie-line between Bonneville and Grand Coulee dams, Administrator Paul J. Raver stated that the Bonneville Power Administration had made temporary arrangements with the Washington Water Power Co. for the interconnection of the two systems near Stratford, Wash., while the Bonneville line crosses that of the private utility.

•

Grand River Dam Outlet

Virtual assurance has been given in Washington that a $20,000,000 powder plant will be built at Miami, Okla., in the Grand River Dam area, according to reports. The proposed plant would use power from the Grand River power development.

Oregon Lumber Firm Plans 3,000-Kw. Unit

Plans for an immediate installation of a 3,000-kw. steam turbo-generator unit at the Brooks-Scanlon Lumber Co. at Bend, Ore., to provide increased power supply for the Deschutes area have been completed, according to George T. Bragg, vice-president and general manager of the Pacific Power & Light Co.

Under a contract with the lumber company, Pacific Power will install and maintain the new generating unit, while the former will furnish the necessary steam from the mill's present boilers and will be responsible for the operation. Construction crews have started work on the concrete foundations, with installation to be completed by September 15 at a cost of $75,000.

The new unit will supplement power from hydro-electric units at Bend and Cline Falls, on the Deschutes River, and at Cove, on the Crooked River, with which the Pacific system serves the upper Deschutes Valley, including Bend, Redmond, Prineville, Madras and the surrounding farm territory.

Number of customers served by Pacific Power through the Deschutes system has increased 44 per cent in the past five years. Use of electricity by residential customers in the district averages 1,998 kw.-hr. per year.

•

Changes Wiring Policy

The Chattanooga (Tenn.) Power Board has made a change in the free wiring for electric ranges effective as of September 1. The new policy calls for the payment of a portion of the installation cost by the purchasers of electric ranges. Heretofore the board assumed the entire installation cost.

•

Propose New Power Plant

Construction of a new power plant on the Musquash River, Georgian Bay district, to cost between $1,000,000 and $1,500,000, is being considered by the Ontario Hydro-Electric Power Commission, it was announced recently by commission officials. Plans and estimates are being prepared and municipalities concerned are being consulted on the proposal.

•

Energy Sales Up 10%

Total sales of electric energy to ultimate consumers by the eleven largest electric utilities in the State of Illinois amounted to 639,169,325 kw.-hr. in July, as compared with 578,885,680 kw.-hr. for the same month last year. This is a 10.4 per cent increase.

MEETINGS

Illuminating Engineering Society—Annual meeting. Essex and Sussex Hotel, Spring Lake, N. J., September 9-12. F. G. Horton, executive secretary, 51 Madison Av., New York, N. Y.

Rocky Mountain Electrical League—Annual convention, Albuquerque, N. M., September 9-11. George Lewis, Manager, Gas & Electric Building, Denver, Colo.

International Association of Electrical Inspectors—Annual meeting, southern section, Houston, Tex., September 16-20; western section, Kansas City, Mo., September 23-27; eastern section, New York, N. Y., October 7-11.

Wisconsin Utilities Association—Annual convention, accounting section, Lawsonia Hotel, Green Lake, Wis., September 16-17; electric section, commercial and technical divisions, Hotel Pfister, Milwaukee, November 11-12. A. F. Herwig, executive secretary, 135 West Wells St., Milwaukee, Wis.

Southeastern Electric Exchange—Engineering and operation section, Fort Sumter Hotel, Charleston, S. C., September 19-20. J. W. Talley, executive secretary, 308 Haas-Howell Bldg., Atlanta, Ga.

Association of Iron and Steel Engineers—National convention, Chicago, Ill., September 24-27, Brent Wiley, managing director, Empire Bldg., Pittsburgh, Pa.

Indiana Electric Association—Annual convention, French Lick, Ind., September 25-27, R. E. Blossom, secretary, 1414 Circle Tower, Indianapolis, Ind.

Empire State Gas and Electric Association—Annual convention, Westchester Country Club, Rye, N. Y., September 26-27. George H. Smith, secretary, Grand Central Terminal, New York, N. Y.

Electrochemical Society—Fall meeting, Ottawa, Canada, October 2-5. Colin G. Fink, secretary, Columbia University, New York, N. Y.

Public Utilities Association of West Virginia—Meeting of utilities of Virginia and West Virginia, Greenbrier Hotel, White Sulphur Springs, W. Va., October 4-5. A. Bliss McCrum, secretary, 612 Charleston National Bank Bldg., Charleston, W. Va.

Edison Electric Institute—Electrical equipment committee, Jefferson Hotel, Richmond, Va., October 7-8; transmission and distribution committee, Henry Grady Hotel, Atlanta, Ga., October 14-16. H. S. Bennion, managing director, 420 Lexington Av., New York, N. Y.

American Institute of Electrical Engineers—Middle Eastern district meeting, Cincinnati, Ohio, October 9-11; winter convention, Philadelphia, Pa., January 27-31. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

International Municipal Signal Association—Annual meeting, Roosevelt Hotel, Jacksonville, Fla., October 14-17. Irvin Shulsinger, secretary, Eight East 41st St., New York, N. Y.

American Welding Society—Annual meeting in conjunction with the National Metal Exposition, Cleveland, Ohio, October 20-25. Miss M. Kelly, secretary, 29 West 39th St., New York.

National Electrical Contractors Association—Fall meeting George Washington Hotel, Jacksonville, Fla., October 21-23. L. W. Davis, general manager, 420 Lexington Avenue, New York, N. Y.

National Electrical Wholesalers Association—Semi-Annual convention, Hotel William Penn, Pittsburgh, Pa., October 22-25. E. Donald Tolles, managing director, 165 Broadway, New York, N. Y.

National Electrical Manufacturers Association—Annual meeting, Waldorf-Astoria Hotel, New York, N. Y., October 27-November 1. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

National Research Council—Conference on Electrical Insulation, annual meeting, Washington, D. C., October 31-November 2. Thorstein Larsen, secretary, 2101 Constitution Av., Washington, D. C.

American Society of Mechanical Engineers—Annual meeting, New York, N. Y., December 2-5. C. E. Davies, national secretary, 29 West 39th St., New York, N. Y.

American Society of Agricultural Engineers—Fall meeting, Chicago, Ill., December 2-6.

Alabama Power Makes Rural Line Survey

A system-wide survey conducted by Alabama Power Co. during June and July of 3,281 miles of existing rural lines, from which there are being served 13,873 customers, shows that on these lines there are 1,608 prospective customers and prospects for sale of 1,896 refrigerators, 1,588 water pumps, 820 ranges, 348 water heaters and 249 miscellaneous farm equipment.

The survey was made in order to become more familiar with the potential prospects along the line and to begin an effort to make electric service more valuable to the citizens along these lines.

Lists of prospective customers interested in equipment are being furnished agricultural engineers, distributors and dealers.

•

Florida Power Adopts Employee Buying Policy

Florida Power Corp., effective as of September 1, has adopted a new policy for handling employee merchandise accounts. Purchases by employees of electrical appliances on a term or charge basis will be billed to the employees on his electric account instead of by payroll deduction as in the past.

The purpose of this change is to relieve the accounting department of extra work in handling these charges as payroll deductions.

•

New Power Line

The Dahlberg Light & Power Co. is building a new power line into Gordon, Wis., from the power plant on the Eau Claire River. A new 70-kw. Diesel generator unit has been installed in connection with the 185-kw. water-power unit. Transmission lines of the company extend across Douglas County and part of Bayfield and Washburn counties, serving about 1,400 customers.

•

Approves Dallas Tax Plan

The City Council has approved the application of the Dallas Power & Light Co. to pass along to its customers part of the federal tax. The company has been paying the 3 per cent tax on revenue, but recently the government boosted the tax one-third cent. The utility carried the increase in July, but asked the Council if it could be added to customers' bills from now on.

Week's Output Rises; 10.3% Over Year Ago

Reversing the downward movement registered in the preceding week, the output of energy by the electric light and power industry rose, in the week ended August 31 to 2,601,127,000 kw.-hr., according to the Edison Electric Institute. This was an increase of 10.3 per cent compared with the corresponding week a year ago, of 21 per cent over 1938 and 12 per cent over 1937. Compared with the week of August 24 there was an increase of 1.2 per cent.

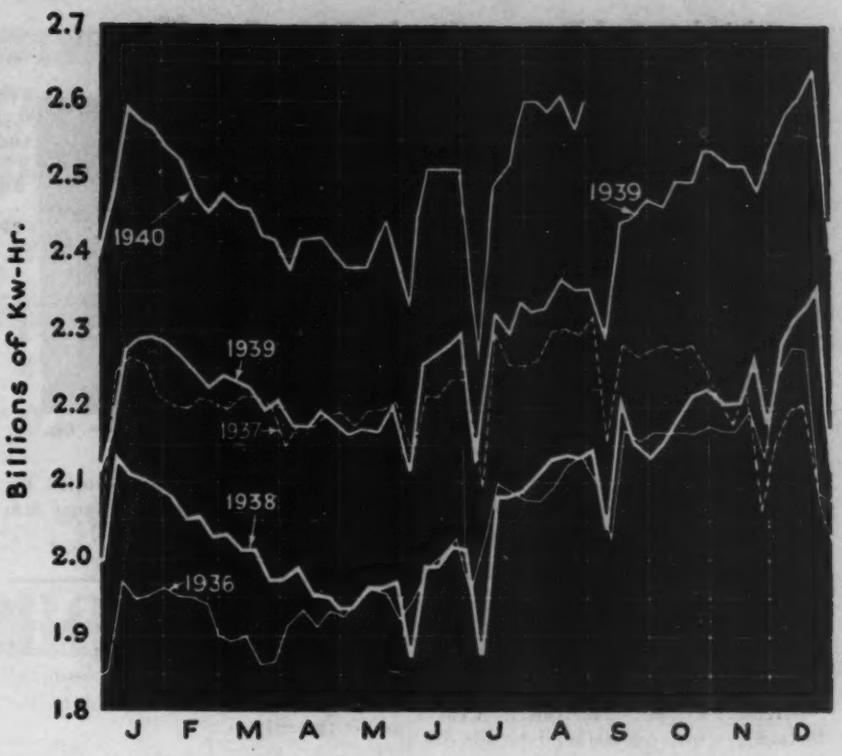
The rise brought a close approach to the maximum of 2,606,122,000 kw.-hr. for the year thus far, recorded in the week ended August 17. The all-time record of 2,641,458,000 kw.-hr. was missed by 1.5 per cent. A year ago the output was virtually the same as at the preceding winter's peak; in 1938 it lacked 2.4 per cent; in the abnormal conditions of 1937 it exceeded the December, 1936, maximum by 1.9 per cent.

Weekly Output Millions Kw.Hr.

1940		1939		1937	
Aug. 31	2,601	Sept. 2	2,357	Sept. 4	2,321
Aug. 24	2,571	Aug. 26	2,355	Aug. 28	2,295
Aug. 17	2,606	Aug. 19	2,368	Aug. 21	2,304
Aug. 10	2,589	Aug. 12	2,333	Aug. 14	2,301
Aug. 3	2,605	Aug. 5	2,325	Aug. 7	2,262
July 27	2,601	July 29	2,342	July 31	2,256
July 20	2,524	July 22	2,295	July 24	2,259

Per Cent Change from Previous Year

	Week Ending		
	Aug. 31	Aug. 24	Aug. 17
New England	+ 4.5	+ 5.4	+ 3.1
Middle Atlantic	+ 6.8	+ 3.3	+ 5.6
Central Industrial	+15.7	+15.5	+16.4
West Central	+ 8.6	+11.2	+ 8.5
Southern States	+10.0	+ 6.3	+ 8.1
Rocky Mountain	+10.7	+15.0	+18.2
Pacific	+ 4.1	+ 3.4	+ 5.0
United States	+10.3	+ 9.2	+10.1



Regional comparisons with last year's operations show that gains continue to be largest in the Rocky Mountain and Central Industrial regions; moreover, last year these regions were far ahead of 1938, by 19.6 and 12.8 per cent respectively.

Production Steps Up; Capacity Also Gains

Production of electric energy for public use during July amounted to 11,827,869,000 kw.-hr., compared with 10,482,000,000 kw.-hr. a year ago, indicating an increase of 12.8 per cent, and with a revised total of 11,311,000,000 kw.-hr. in June, giving an increase of 2.0 per cent in average daily production, according to the Federal Power Commission. Water-power accounted for 4,144,915,000 kw.-hr. or 35 per cent of the output for public use.

Production during the twelve months ended July 31 was 136,750,000,000 kw.-hr., or 12 per cent more than in the previous year.

Reports received during August indicate that the capacity in service on July 31 was 40,922,000 kw., a net increase of 268,000 kw. over capacity previously reported in service on June 30.

There was a striking increase in stocks of coal on hand August 1 compared with a year ago; the amount was 11,703,816 tons, the increase 42.2 per cent. The gain over July 1 was 3.8 per cent. Consumption during July was approximately 4,267,248 net tons, of which 4,078,936 were bituminous and 188,312 anthracite. In terms of days' supply there was enough bituminous coal on hand August 1 to last 80 days and enough anthracite for 188 days.

•

Energy Sales Rise 11.1% Over Last Year

Rising 1.2 per cent compared with the preceding month and 11.1 per cent over the amount a year ago, sales of energy to ultimate consumers during June nearly matched the February figure and missed January, peak month of 1940 thus far, by only 6 per cent, with a total of 9,474,481,000 kw.-hr., according to the Edison Electric Institute. The corresponding revenue, $195,745,500, exceeded that of June, 1939, by 6.1 per cent, although it was smaller than in the winter months, as is normally the case. Comparable totals for that season were $218,514,100 in December and $213,096,000 in January.

Meanwhile the number of customers continued to increase, reaching an all-time high of 29,671,561, 3.4 per cent more than a year ago. Of the gain of 976,078 customers 835,377 were in the residential group.

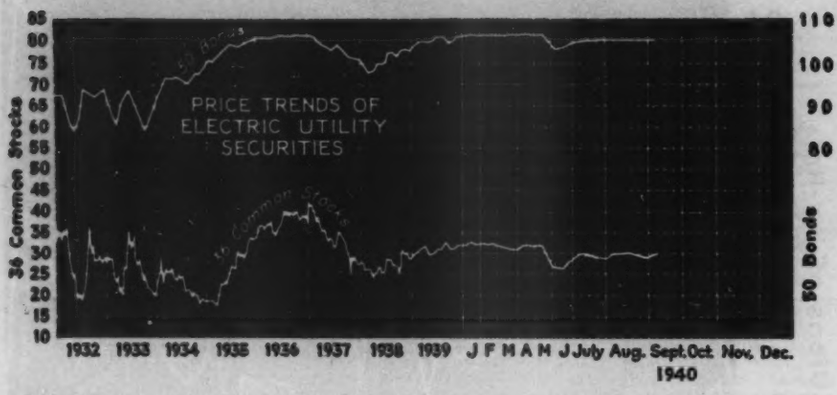
Sales to large light and power customers—indicative of industrial activity—were the largest for any month in the year thus far, 1.3 per cent over January, followed successively by 6.0, 6.2, 4.7 and 0.6 per cent.

Average residential consumption for the year ended June 30 was 925 kw.-hr. per customer, the average bill $36.17 and the average revenue per kw.-hr. 3.91 cents, indicating changes compared with a year ago of +5.6, +1.5 and —3.9 per cent, respectively. Comparable statistics for May were published in ELECTRICAL WORLD of August 3, 1940, on page 15.

Classification of Sales, June, 1940 and Change from 1939 (Revised Series)

	Million Kw.-Hr. 1940	1939	% Change
Residential or domestic	1,798	1,626	+10.6
Rural (distinct rural rates)	208	214	— 2.8
Commercial or industrial			
Small light & power	1,799	1,688	+ 6.6
Large light & power	4,827	4,160	+16.0
Street & highway ltg.	130	128	+ 1.5
Other public authorities	215	210	+ 2.5
Railways & railroads			
Street & interurban	293	300	— 2.2
Electrified steam	146	144	+ 1.0
Interdepartmental	58	54	+ 6.8
Total to ult. consumers	9,474	8,525	+11.1

Light and Power Stocks Rise; Bonds Firm


PRICE TRENDS OF
ELECTRIC UTILITY
SECURITIES
36 Common Stocks
50 Bonds
1932 1933 1934 1935 1936 1937 1938 1939 J F M A M J July Aug. Sept. Oct. Nov. Dec.
1940

Slight gains in the price of electric light and power stocks this week carried the "Electrical World" index up to 29.0 from 28.6 the preceding week; last year, 30.6. Bond index stood at 105.7; last week, 105.8

Action on Dividends Taken by Utilities

Directors of the North American Co. declared regular quarterly dividends of 75 cents per share on the 6 per cent preferred stock and 71⅞ cents per share on the 5¾ per cent preferred stock and a dividend of 30 cents per share on the common stock, for the quarter ending September 30, 1940, payable October 1 to holders of record September 10.

In addition the directors declared a special dividend on the common stock, also payable October 1 to common-stock holders of record September 10, in the form of certificates for participating units of beneficial ownership of common stock of Washington Railway & Electric Co. Each participating unit will represent beneficial ownership of one-fortieth of a share of common stock of $100 par value of Washington Railway & Electric Co. and the special dividend is payable at the rate of one participating unit for each 100 shares of North American common stock. No fractional participating units will be issued, but in lieu thereof cash will be paid at the rate of 20 cents per share of North American common stock to holders of less than 100 shares of such stock and to holders of more than 100 shares of such stock with respect to the excess over the largest multiple of 100 shares represented by their holdings.

Directors of Consolidated Gas, Electric Light & Power Co. of Baltimore have declared dividends for the quarter ended September 30 of 90 cents per share on the common stock, $1.12½ per share on the 4½ per cent series B preferred stock and $1 per share on the 4 per cent series C preferred stock, all payable October 1 to shareholders of record September 14.

The dividend of $1 for the quarter on the 4 per cent series C preferred is the first dividend on the issue of 68,928 shares which were sold to the public recently.

Wisconsin Power & Light Co. will soon begin reducing its deferred dividend account by paying special dividends of $1 per share on the outstanding 6 per cent preferred stock and $1.16⅔ on the 7 per cent stock. The special dividend, together with the regular quarterly dividend, will be paid September 15 to stockholders of record August 31. The deferred dividends, accumulated between December 1, 1932, and June 1, 1939, aggregate $3,442,116, or $18.50 on the 6 per cent stock and $21.58 a share on the 7 per cent stock.

Directors of the American & Foreign Power Co. recently declared a dividend of 30 cents per share on the $6 preferred stock and 35 cents per share on the preferred stock ($7) for payment September 16, 1940, to the stockholders of record September 6. These dividends are on account of accumulations for the quarter ended March 31, 1932.

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Asks Extension on Midland

Federal Judge John P. Nields has received a petition to stay the hearings on reorganization of Midland United Co. and Midland Utilities Co. for another 30 days. The trustee of the companies, formerly affiliates of the old Mid-West Utilities, presented the petition to the court. Claims and counter-claims of the bankrupt utilities have held up the reorganization proceedings for several years.

•

Abitibi Bonds Deposit

With more than 60 per cent of bonds of Abitibi Power & Paper Co., Ltd., on deposit, the bondholders' protective committee has announced that it has fixed September 14 as the final date for receiving deposits of bonds under the plan to terminate the company's receivership through a judicial sale of its assets. The sale of the property and assets is scheduled to take place in Toronto on October 16 and is in accordance with the plan of procedure promulgated by the committee.

•

Hearing on Proposed Merger Deferred

Public hearing on the proposed plan of consolidation of Central and South West Utilities Co. and American Public Service Co. has been postponed from September 3 to September 17.

American Public Service Co. is a subsidiary of Central and South West Utilities Co., which in turn is a subsidiary of the Middle West Corp. It is proposed to consolidate the two companies into a new corporation to be known as Central and South West Corp.

The plan proposes the issuance by the new corporation of 188,709 shares of 5½ per cent preferred stock, $100 par value, and 1,041,274 shares of common stock, $15 par value. These securities are to be offered in exchange to the security holders of Central and South West Utilities Co. and American Public Service Co.

•

SEC Adopts Amendments

Securities and Exchange Commission has announced the adoption of amendments to the rules under the Holding Company Act relating to interlocking directorates and to the acquisition or retirement of securities by the issuing company. Two amendments were adopted to the rules under Section 17 (c), which authorizes the commission to permit interlocking relationships where the public interest or the interest of investors or consumers will not be adversely affected.

Utility Reports

	Net Income 1940	1939
*Arkansas Power & Light	$1,165,212	$1,398,364
†Associated Electric and subs.	2,486,955	2,177,820
*Birmingham Electric	566,972	571,419
*Central Arizona Light & Power	873,145	810,065
*Commonwealth & Southern and subs.	13,558,470	13,110,457
*Florida Power & Light	2,292,864	1,568,316
*Houston Lighting & Power	2,879,745	2,859,340
*Louisville Gas & Electric and subs.	3,018,409	2,690,852
*Mississippi Power & Light	466,610	551,531
*Northwestern Electric	527,863	540,536
*Southern Colorado Power	222,708	275,606
*Superior Water, Light & Power	112,642	116,423
*Texas Power & Light	2,086,454	2,061,916
*Utah Power & Light‡	1,672,636	1,604,929

*Twelve months ended July 31.
†Twelve months ended June 30.
‡Including Western Colorado Power.

HOW CAN I STEP-UP PRODUCTION... FAST ...WITH NO TIME FOR NEW BUILDINGS... AND SKILLED LABOR GETTING SCARCER?

General Electric offers

AN EFFECTIVE SOLUTION TO TODAY'S EMERGENCY PRODUCTION PROBLEMS!

THE present national emergency demands that industry produce more goods . . . of better quality . . . and at greater speed than ever before.

If there's no time for new buildings, and skilled labor is difficult to get, the alternative is to get more and better production from existing equipment.

Adequate plant lighting . . . better light for faster, safer, more accurate seeing . . . offers every industrial plant in the country an effective means to meet today's emergency production demands.

Industrial lighting surveys show that most plants can go a long way toward better production schedules by bringing their lighting up to modern standards of efficiency. The fact is that higher levels of properly planned lighting have a direct bearing on increased production.

General Electric is ready to help provide better lighting immediately to increase production in your customers' plants. Not only should you consider the most effective light source to fit their particular requirements but also the electric equipment necessary to supply power to the fixture. Transformers for increased power supply, regulators to keep voltage levels up, adequate industrial wiring to provide power with minimum loss in the line—all are equally important if customers are to obtain the proper lighting for every manufacturing operation.

Read carefully the following pages describing many G-E products used in industrial lighting. Fill out the coupons which will bring you more specific information on products of interest. Better still—get in touch immediately with your nearest General Electric Sales Engineer. He stands ready to work with you for Better Light for Better Production.

GOOD LIGHTING MEANS BETTER PRODUCTION BECAUSE IT:

1—*Makes seeing easier, faster, more accurate;*

2—*Increases efficiency and reduces fatigue;*

3—*Reduces accidents;*

4—*Conserves eyesight;*

5—*Improves morale of employees because of brighter, more cheerful working conditions.*

For further specific information, see each of the General Electric advertisements on the following right-hand pages.

GENERAL ELECTRIC

BETTER LIGHT MEANS BETTER PRODUCTION

OPERATING PRACTICES

Interlock Oil Fuses for Industrial Feed

By W. B. KENYON
Assistant Distribution Engineer
Rochester Gas & Electric Corporation

Experience over two years with four sets of interlocked oil-immersed fuses for dual feed to industrial customers has been good as to both operating performance and economy. Wherever fuses are appropriate as protection for the service and there is duplicate feeder service provided, such interlocked fuses are supplied instead of oil switches, and the oil fuse thus serves a double function. The interlock links and fuses are rated up to 200 amp. for loads of not more than 1,000 kw.

Emergency transfer operation does not require the normal fuse contacts to interrupt current, and the emergency fuse contacts readily pick up the partial load after an interruption. Normal transfer to emergency circuit without interruption may be accomplished by utility employees by blocking the circuit regulators and temporarily removing the interlock link.

The scheme is used in vaults or outdoors in suitable fenced inclosures.

•

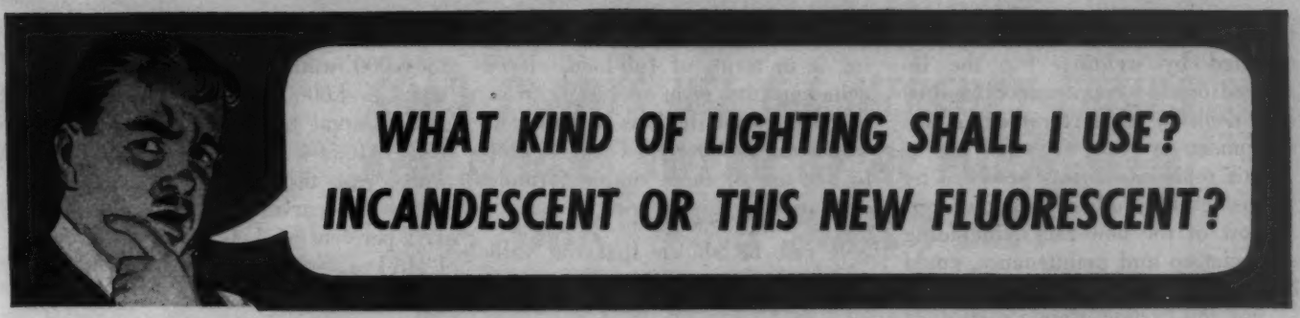
Trash Racks Use Stainless Steel

Experience to date indicates that the expectations of easier and cheaper maintenance of the new trash racks at Holtwood hydro plant of Pennsylvania Water & Power Company have been realized. After two years' exposure the stainless steel bars and tie rods are as bright as they were originally and show no signs of surface attack. While the mild steel frame will still have to be repainted periodically, this will take only a fraction of the time and labor it required to paint the original racks and the job can be spread out over longer intervals because all these parts are of substantial thickness.

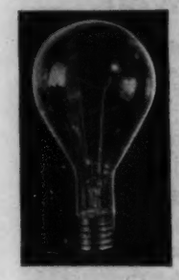
STAINLESS STEEL AIDS MAINTENANCE Trash rack using stainless steel rack bars—3 x 5/16-in. round-edge flats—and tie rods (below, after several months' exposure) is 30 per cent lighter than old rack top with 4 x ⅜-in. mild steel flat rack bars. Obstructed area of new rack is only 7 per cent; it is 22 per cent for the old rack. Since 1937, 84 of the 204 old racks have been replaced with the new units, 24 more of which are to be added soon. Racks are aproximately 10 ft. wide and 11 ft. high; total weight of original racks was about 600 tons, exclusive of guides.

INTERLOCKED OIL FUSES for feeder transfer. Both switches are here in the open position. A wood platform on insulators is provided

Rust was removed every four years from the old racks by sand blasting and then they were repainted with an asphalt base paint. Around 1935 it became evident that this equipment —installed in 1910—was approaching the end of its life. The edges of the channels which slide on the guides holding the racks had worn very thin and the rack bars had loosened at the point of attachment, due to loss of



G-E MAKES ALL KINDS OF LAMPS BUT EACH LIGHTING JOB MUST BE "TAILOR-MADE"



REGARDLESS of the kind of business your customers operate, General Electric makes lamps to fit their needs. Because G. E. makes all types of lamps, you can make an unbiased lighting recommendation.

Not only in industrial plants but in offices, too, work goes faster and more efficiently when the lighting is right to meet seeing needs. Sometimes, because of the plant layout and the particular kind of work done, incandescent lighting with G-E MAZDA C (filament) lamps will produce light most efficiently.

In other places fluorescent lighting with G-E MAZDA F (fluorescent) lamps will provide the higher lighting levels required. So that your customers will know where and *where not* to use it for best results, G. E. urges them to consult a qualified local authority . . . *to show them* how to get 50 footcandles or more . . . either with G-E MAZDA C lamps, or with G-E MAZDA F lamps, or other types of G-E MAZDA lamps or a combination of them. For specific information, write to General Electric Company, Dept. 166-EW-I, Nela Park, Cleveland, Ohio.

INCANDESCENT LIGHTING SPEEDS PRODUCTION IN THESE PLANTS

A CHICAGO RADIO company found production up, rejects down, after light-conditioning with regular G-E MAZDA C (filament) lamps. Employees have 55 footcandles of light on assembly work.

THIS CLEVELAND manufacturing plant appreciated that good light is indispensable in the manufacture of a quality product and used 300 watt G-E MAZDA C lamps in RLM dome reflectors to get it.

FOR CONCENTRATED localized light where it's needed in shops and factories, the new G-E MAZDA Projector lamp helps speed production. Lens, reflector, and filament are combined in one unit.

FACTORY FLOODLIGHTING is an essential requirement in many places today . . . not only to facilitate night work but also as an added safety precaution. G. E. makes many types of flood lamps.

FLUORESCENT LIGHTING IS BETTER SUITED TO THESE JOBS

INSPECTION is made easier and eyestrain lessened by G-E Fluorescent lighting installations such as this one over inspection tables in a tin-plate plant. This better lighting has speeded production and reduced spoilage.

FINE WORK, as in textile mills like this, needs well diffused light to soften shadows and reduce glare. G-E MAZDA F lamps may provide 100 footcandles or more without discomfort from heat.

LOOK FOR THIS TAG—certifying that fixture meets specifications set up by MAZDA lamp manufacturers. Fleur-O-Liers must be equipped with auxiliaries (ballast and starters) certified by E.T.L.

WIDE CHOICE of fixtures. For best results, G-E MAZDA F lamps are recommended for use only with equipment providing good power factor . . . fixtures such as Fleur-O-Liers or RLM industrial units.

metal. For a while such defects were repaired by welding, but the increased cost of maintenance resulted in a decision to start replacing this equipment.

This replacement was preceded by a considerable study of how the over-all cost of the new racks, including depreciation and maintenance, could be kept at a minimum. It was decided to use low-carbon stainless steel of the straight chrome variety (10 to 12 per cent chromium) for the rack bars and for wearing strips along the plane of contact with the cast iron guides, but to retain mild steel for the structural frame. The latter makes up two-thirds, stainless steel parts one-third, of the total weight of the new racks.

Although the stainless steel rack bars are of lighter cross-section than the flats in the original racks, they have about the same strength because of the higher physical characteristics of stainless steel. Additional weight was saved by using welding exclusively for the assembly of the new racks and this eliminated gusset plates, clip angles and other obstructions to the flow of water. With regard to over-all dimensions and handling methods, the new racks are interchangeable with the old ones, an important feature, especially during the transition period, when both types have to be used.

•

Economical Closure of Open-Delta Banks

By JAMES F. DEFFENBAUGH
Ohio Public Service Company, Sandusky

Comparison of the total losses in single-phase transformers connected either in open delta or closed delta to supply three-phase power shows that there is usually a value of load below the full-load open-delta capacity at which the losses for either bank are equal. Above this point the losses of the open-delta bank are increasingly greater than the closed-delta losses. Practically, this means that although the full-load capacity of the open-delta bank has not been reached, the addition of the third transformer at the proper value of load will actually reduce the total bank losses from this point on.

Locating this value of load, which occurs at the point of intersection of the open-delta loss curve and the closed-delta loss curve, and expressing it in terms of full-load, closed-delta capacity, is an operation involving somewhat tedious calculations which can be shortened considerably by the use of three simple formulas developed by the author.

It can be shown that the value of load equals $0.578\sqrt{\frac{K}{C}}$, where K represents iron loss and C the copper loss of one transformer, expressed in watts. In other words, the load value will be less than the full-load capacity of the open-delta bank if the ratio of iron to copper loss is less than 1.

The equation of the curve giving the total loss for any load for the closed-delta connection is $Y_c = 3(CL^2 + K)$, where Y_c is the total loss of bank in watts, L is the per cent of full-load capacity, expressed as a decimal, C and K have been defined above. (Note—It is assumed that each of the transformers in the bank has identical characteristics.) For the open-delta connection the equation is $Y_o = 2[C(L\sqrt{3})^2 + K]$. And the point of intersection of the curves is

$$L = \sqrt{\frac{K}{3C}} \text{ or } L = 0.578\sqrt{\frac{K}{C}}$$

Since the full-load capacity of an open-delta bank is approximately 58 per cent of the full-load capacity of an equivalent closed-delta bank, the losses of both types of banks will be calculated for this load and the point above which the losses of the closed-delta bank are less than the losses of the open-delta located. Thus, with three 1,000-kva. transformers, C equal to 6,000 watts per transformer, K equal to 4,000 watts per transformer and L equal to 58 per cent, Y_c becomes 18,504 watts and Y_o 20,120 watts, with the point of intersection of the two curves equal to 0.471, or 47.1 per cent of 3,000 kva., which is 1,413 kva., or less than the open-delta, full-load capacity.

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Group Removal Meter Testing Works Well

By J. W. CUDDOHY
Superintendent Meter Department,
Consumers Power Company, Grand Rapids, Mich.

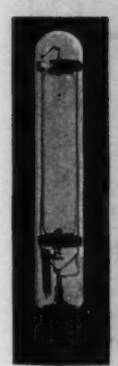
In 1933 a change from 30 to 60 cycles in the western division of the Consumers Power Company, involving some 100,000 meters, was completed. The ease with which these meters were removed to the shop, rebuilt and returned to service led us to try group removal for periodic meter testing. The same two trucks with special bodies and padded meter bins that were used in the frequency change were employed in replacing meters scheduled for test. The removed meters were brought to the shop for test instead of conducting the tests on the customers' premises.

To date our experience in bringing all single-phase, 5 to 25-amp. meters in for shop test has been very satisfactory. We find that two men will change 38 to 44 meters in an eight-hour day in urban areas. This number is cut down somewhat in rural areas and these changes are usually made

TWO METERMEN using special bodied truck with padded meter bins remove 38 to 44 meters per day for group testing in shop

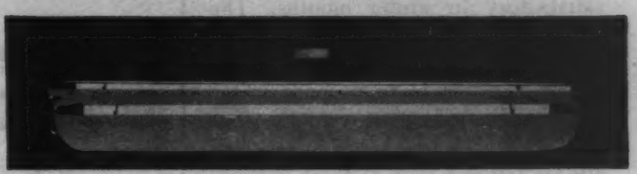
SOME PLANTS USE G-E MERCURY LAMPS AND OTHERS SWEAR BY RF FLUORESCENT ...WHICH KIND SHALL I USE?

GENERAL ELECTRIC MAKES BOTH KINDS AND EACH IS WELL SUITED TO SPECIFIC JOBS



IN general, G-E MAZDA H (mercury) lamps are best suited for lighting high bay areas. The 400 watt size is shown to the left. These lamps have high efficiency, long life, and ruggedness. Mercury lighting is most economical when it is tailored to the individual plant needs — properly used and distributed, using approved auxiliary equipment. It may be used advantageously either alone or in combination with filament lamps.

RF 85 watt (Cooper Hewitt) fluorescent lamps, are well suited for lighting low and medium bays. Have high light output, long life, and low operating cost. Available in two types—a



Blue-White and an industrial White, in one and two lamp fixtures. The color of the new industrial White lamp more closely resembles natural daylight than does the Blue-White lamp and will prove practical for many industrial applications where color discrimination is important. For details, write General Electric Company, Dept. 166-EW-I, Nela Park, Cleveland, O.

MERCURY LAMPS ARE GOOD FOR LIGHTING HIGH BAY AREAS

MODERN LIGHTING with G-E MAZDA H (mercury) lamps provides "better than daylight" illumination in this factory. This lighting was engineered to the job, shadow, glare, and light quantity are controlled.

IN THIS LOCOMOTIVE repair shop, 400 watt mercury lamps are used for high bay lighting. Good lighting like this aids accuracy by relieving nervous tension of eyestrain. It also helps reduce accidents.

IN THIS METAL working plant a mercury lamp installation provides 30 footcandles on the working plane although the lamps are mounted at a 35-foot height. Seeing is easier and more productive.

IN THIS PLANT production was speeded when mercury lamps were installed at a 14-foot height to provide 75 footcandles on the working plane. Better light like this is a big factor in obtaining better production.

RF (COOPER HEWITT) FLUORESCENT LAMPS FOR LOW BAYS

IN THE AUTOMOTIVE industry, RF Fluorescent lamp installations find many applications such as lighting this paint spray booth. Heat is less bothersome because more of the electric energy is converted into light.

RF FLUORESCENT lamps provide excellent illumination in this southern hosiery mill. Under this well-diffused light, threads are so clearly defined as to appear magnified. Inspection is simpler and production up.

NOTICE HOW CLEARLY detail is revealed in the light of this RF Fluorescent installation in an Illinois factory. Because of the long-tube light source, shadows are controlled. There is less eyestrain, less fatigue.

IN THIS 5-ACRE windowless plant, all daylight has been excluded. The plant is lighted entirely with RF Fluorescent lamps. The installation provides a uniform level of light throughout the plant.

GENERAL ELECTRIC

BETTER LIGHT MEANS BETTER PRODUCTION

by faster cars and one man. Also, we find that meters are tested under better conditions, all necessary repairs are easily made, customers are not inconvenienced, as it takes only a few minutes to change a meter, and metermen are not required to carry test meter, loading device and tool from job to job. A corollary advantage is use of meter "turn-off" and "turn-on" men and meter installers' time to handle some of the test changes when work on their routes is not heavy.

House-to-house testing of outdoor meters in Michigan would not be very satisfactory in winter months. The group removal practice allows testing of this type of meter the year round.

Our practice is to prepare meter test change orders prior to the first of the year in which the meters are due for test and arrange them in route order. These routed change orders are given to a two-man crew.

Shop Procedure

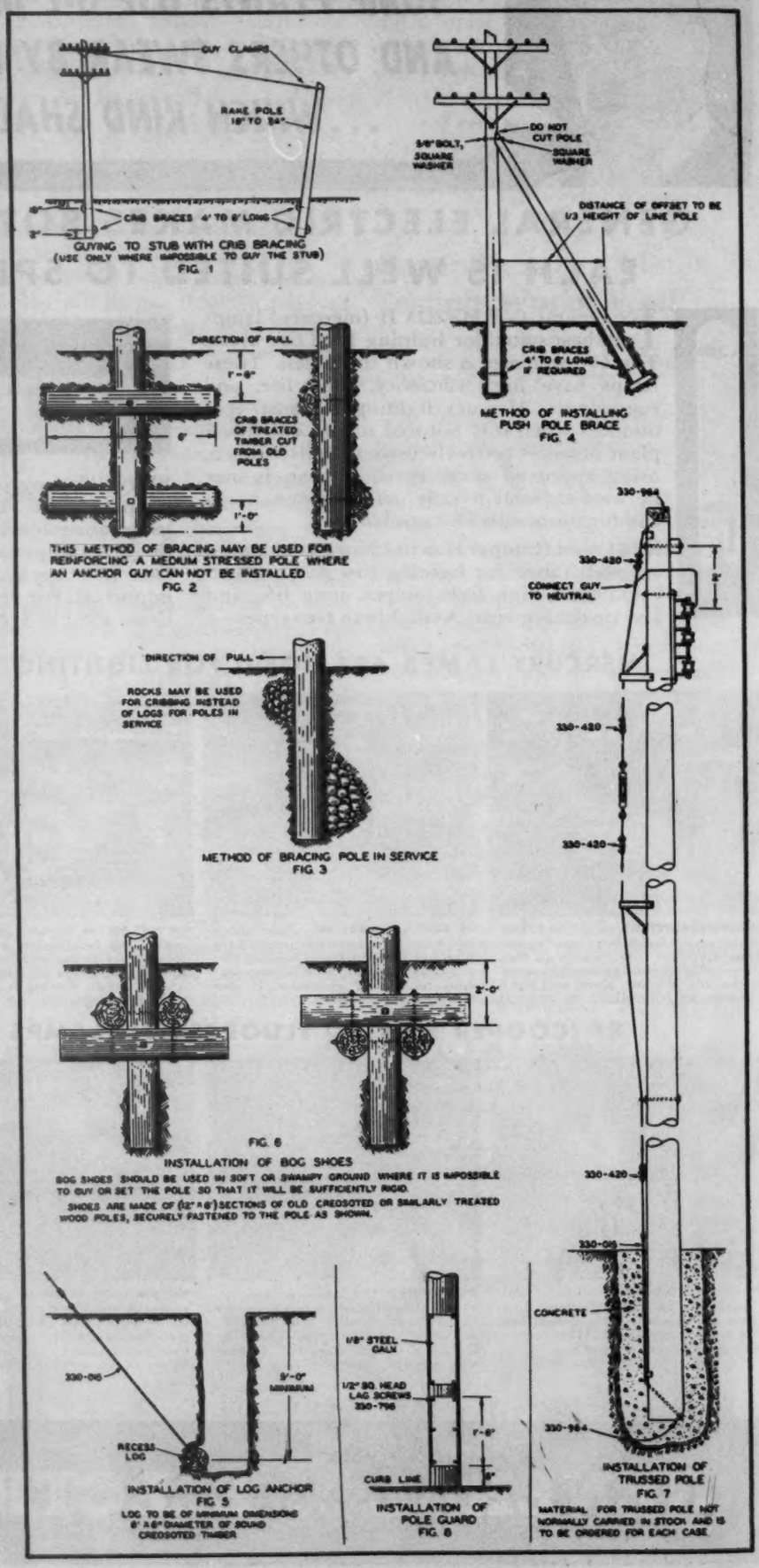
When the removed meters are brought into the shop they are cleaned on the outside and the "as found" test is run before the cover seal is disturbed. The few meters that require painting and minor repairs are returned to the repair shop for this work before the "as left" test is made.

Practically all meters tested under this scheme so far have been of the conventional bottom-connected type and the cost of group testing has been favorable with the older method of house-to-house testing. In 1940, however, we will encounter several thousand detachable type meters. We expect a substantial saving as more meters can be changed per day since it will not be required to gain admittance to the customers' building.

Actual testing in the shop is performed on six-position gang test boards. Part of the original test equipment used through the frequency change has been replaced by new type automatic gang test boards which were described in ELECTRICAL WORLD, December 31, 1938, page 19. The new boards are about 50 per cent faster than the old and will check six two- or three-wire meters or three two-wire and three three-wire meters at the same time provided the basic K is the same. In addition to the accuracy test on the meters, all registers are checked for proper ratio when the meters go through the test room.

Pole Bracing Standards

for urban or main trunk lines used by Mississippi Power & Light Company for systems 8,000 volts or less to ground


GUY CLAMPS
RAKE POLE 18" TO 24"
CRIB BRACES 4' TO 8' LONG
GUYING TO STUB WITH CRIB BRACING (USE ONLY WHERE IMPOSSIBLE TO GUY THE STUB)
FIG. 1
DO NOT CUT POLE
5/8" BOLT, SQUARE WASHER
SQUARE WASHER
DISTANCE OF OFFSET TO BE 1/3 HEIGHT OF LINE POLE
CRIB BRACES 4' TO 8' LONG IF REQUIRED
METHOD OF INSTALLING PUSH POLE BRACE
FIG. 4
DIRECTION OF PULL
CRIB BRACES OF TREATED TIMBER CUT FROM OLD POLES
THIS METHOD OF BRACING MAY BE USED FOR REINFORCING A MEDIUM STRESSED POLE WHERE AN ANCHOR GUY CAN NOT BE INSTALLED
FIG. 2
330-984
330-420
CONNECT GUY TO NEUTRAL
DIRECTION OF PULL
ROCKS MAY BE USED FOR CRIBBING INSTEAD OF LOGS FOR POLES IN SERVICE
METHOD OF BRACING POLE IN SERVICE
FIG. 3
330-420
330-420
FIG. 6
INSTALLATION OF BOG SHOES
BOG SHOES SHOULD BE USED IN SOFT OR SWAMPY GROUND WHERE IT IS IMPOSSIBLE TO GUY OR SET THE POLE SO THAT IT WILL BE SUFFICIENTLY RIGID.
SHOES ARE MADE OF (12" X 8") SECTIONS OF OLD CREOSOTED OR SIMILARLY TREATED WOOD POLES, SECURELY FASTENED TO THE POLE AS SHOWN.
330-420
330-06
CONCRETE
330-984
INSTALLATION OF TRUSSED POLE
FIG. 7
MATERIAL FOR TRUSSED POLE NOT NORMALLY CARRIED IN STOCK AND IS TO BE ORDERED FOR EACH CASE.
330-06
5'-0" MINIMUM
RECESS LOG
INSTALLATION OF LOG ANCHOR
FIG. 5
LOG TO BE OF MINIMUM DIMENSIONS 8' X 8" DIAMETER OF SOUND CREOSOTED TIMBER
1/8" STEEL GALV.
1/2" SQ. HEAD LAG SCREWS 330-796
CURB LINE
INSTALLATION OF POLE GUARD
FIG. 8

SPEAKING OF FLUORESCENT AND MERCURY LIGHTING, WHAT ABOUT THOSE LOCAL POWER-FACTOR REGULATIONS?

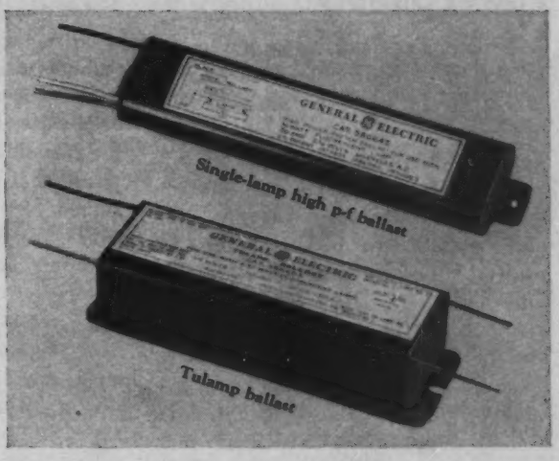
IF YOUR LAMPS ARE EQUIPPED WITH G-E BALLASTS, POWER-FACTOR IS NO PROBLEM

FLUORESCENT installations comply with all local regulations concerning power-factor when fixtures are equipped with G-E Tulamp or single-lamp high-power-factor ballasts.

These ballasts provide an over-all power-factor of 90 per cent or better, and offer important economies:

1. More lamps can be supplied from existing wiring, because the current drawn by each lamp is greatly reduced.
2. If new circuits are being installed, you can use smaller wire and still provide a margin of capacity for future additional lighting.
3. Losses are lower and voltage regulation is better in feeders and branch circuits.

The benefits of high power-factor cost little. For example, with G-E Tulamp ballasts, high power-factor adds only 2 to 3 per cent to the cost of fixtures for 30- and 40-watt lamps.



Use G-E Fluorescent Lampholders too
Be sure the fixtures you buy are equipped with G-E fluorescent lampholders and replaceable starters. They have been designed for use with G-E fluorescent lamps and ballast equipment.

EXTRA SAVINGS WITH G-E TULAMP TRANSFORMERS FOR MERCURY LIGHTING

G-E Tulamp transformers for MAZDA H (mercury) lamps offer all the advantages of high-power-factor fluorescent ballasts—plus extra savings in installation cost. By using one transformer to supply two outlets, wiring is simplified and installation time and costs are reduced.

The use of G-E Tulamp transformers (available for the 400-watt MAZDA H lamp) adds only about 3½ per cent to the over-all cost of transformers, lamps, and fixtures. Single-lamp high-power-factor transformers are available for both the 400-watt and 250-watt lamps.

Ask the nearest G-E distributor or G-E office for complete information—Bulletin GEA-3293, "Ballasts for Fluorescent MAZDA Lamps," and Bulletin GED-855, "Transformers for MAZDA H Lamps." General Electric Co., Schenectady, N. Y.

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GENERAL ELECTRIC

BETTER LIGHT MEANS BETTER PRODUCTION

INDUSTRIAL ENGINEERING

Improve Dock Crane Power Supply

With the addition of a new crane at the Mystic Docks, Charlestown, Mass., the Jarka Corporation of Boston, stevedore, supplemented the previous facilities operated on 550 volts direct current by a 440-volt, three-phase service for the new unit and brought the total loading capacity of the complete installation of three cranes to 1,400 tons of No. 2 automobile scrap in eight hours. The two older cranes, "A" and "B" in the accompanying illustration, receive energy from a 250-kw. synchronous motor-generator set, which in turn is supplied at 4 kv. by a three-phase line from a neighboring Boston & Maine Railroad substation served by the Boston Edison Co. The latest crane, "C," is, like the others, equipped with an electromagnet for handling scrap iron and steel and the installation is a useful adjunct to the defense facilities of the port.

This dual distribution was required because the motor-generator set's capacity was largely utilized by the two older cranes, with the further point that the newest crane is designed for alternating-current operation, providing higher capacity in handling scrap than the two others. The electromagnets used with the older units are energized from the 550-volt supply through rheostats which provide 300 volts for initial pickup of loads and then 175 volts for holding loads during transfer between cars and vessels. Each of these two electromagnets is of Cutler-Hammer make, 65 in. in diameter, and has a lifting capacity of about 2,200 lb. of cast-iron borings or plate scrap, consuming about 15 kw. within the electromagnet proper, and considerably in excess of this including the rheostat. It is possible that later motor-generator supply will be provided for these electromagnets, mounting the sets on the cranes.

The new crane is driven by a.c. motors of the induction type, with G.E. equipment throughout. Direct current for the electromagnet, which has about 200 lb. more lifting capacity than the first two, is supplied by a 25-kw. motor-generator set carried by the crane. The boom has a maximum length with extension of 100 ft. The electromagnet has a diameter of 65 in. and consumes about 15 kw., the voltage range between 300 and 175 being provided by field control. Tirex cable is used in this installation, with Anderson plugs and Gleason cable reels, the last being installed in each electromagnet supply circuit and on two of the crane power services. The 440-volt, three-phase supply to the new crane is more economical than the 550-volt, d.c. service to the older units.

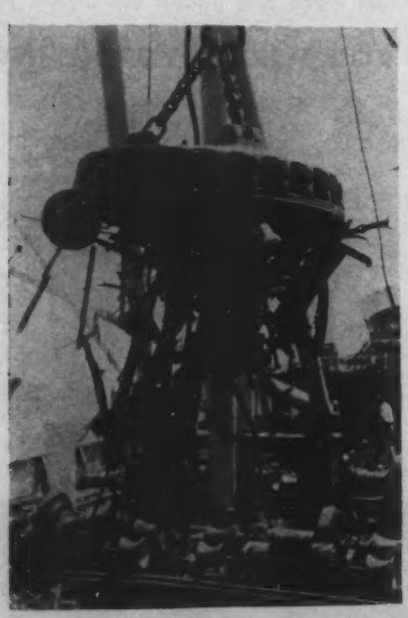
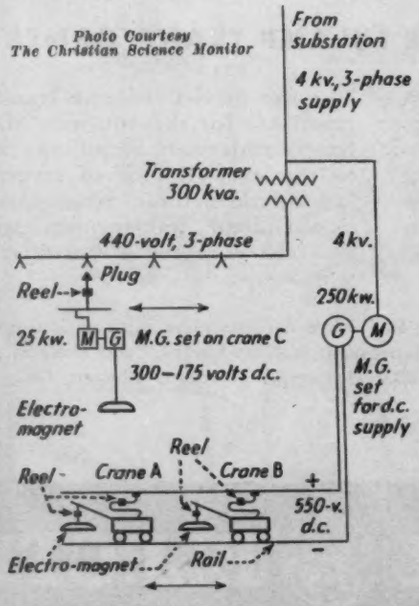


Photo Courtesy The Christian Science Monitor

HANDLING scrap iron with electromagnet speeds stevedore service



SCHEME of wiring layout for three dock cranes equipped with electromagnets

Boost Riser Capacity Without New Copper

By doubling the voltage of feeder risers and installing thirty-nine 75-kva. air-cooled, step-down transformers at load centers on the various floors of the fifteen-story American Furniture Mart, Chicago, increased feeder capacity was secured without recourse to the costlier alternative of installing larger copper and conduit runs from floor to floor.

The increased load that demanded this change was directly traceable to advances in the lighting field. Originally each of the 2,000-sq.ft. sections

I KNOW LIGHTING PROTECTS PROPERTY, PERSONNEL, AND PRODUCTION . . . BUT WHAT KIND SHOULD I HAVE?

OUTDOOR LIGHTING IS NO PROBLEM— JUST SELECT FROM THE COMPLETE G-E LINE

WITH thousands of industrial plants on guard to prevent malicious destruction and production delays—adequate floodlighting is your best protection against property damage, employee injury, and the dangers of outdoor night work. Properly designed and installed, floodlights provide nighttime illumination on buildings, yards, and boundary lines, which definitely discourages trespassing and vandalism. Saboteurs may slip by guards and barriers but they can't evade well-planned protective lighting.

Some plants—because of layout and type of manufacturing processes—may be concentrated in a small area and need general lighting to illuminate the buildings and surrounding area. In larger plants, the protection required may be accomplished by illuminating the property line and providing lighting of low intensity in the inclosed area.

Whatever your requirements, General Electric is ready to help you safeguard property and production, with well planned floodlighting. Adequate warehouse stocks are available to answer your requirements. General Electric, Schenectady, N. Y.

THESE FLOODLIGHTS ARE DESIGNED FOR YEAR-AFTER-YEAR NIGHTTIME PROTECTION

Low-priced, spun-aluminum 300- to 1500-watt enclosed floodlights have beam angles from 28 to 100 degrees. A variety of mounting arrangements makes these units suitable for area lighting.

Porcelain-enamel 300- to 1500-watt units produce a wide-angle flood of light without definite beam characteristics for lighting medium- and large-sized ground areas at close range.

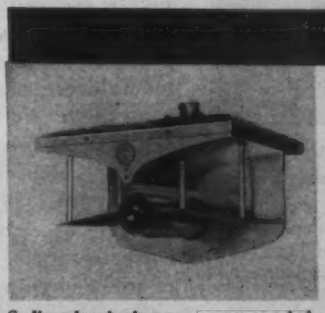
Incandescent 200- to 1500-watt searchlights produce concentrated or wide horizontal beams. Available with 360-degree, horizontal pilot-house control and quick change from narrow to wide beam.

Copper-bronze floodlights have a variety of beam widths. Recommended where considerable precision of light control is wanted or where atmospheric conditions warrant rust-proof materials.

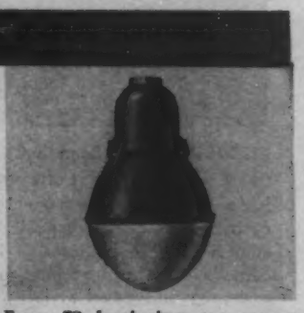
HOW TO USE LIGHT TO PROTECT YOUR PLANT

1. Throw the light into the eyes of the intruder, never on the guard.
2. Illuminate fences to silhouette intruders against a light surface.
3. Protect wiring by running it underground or in conduit where wires can not be cut.
4. Space lights close enough so that edges of beams overlap.

Get recommendations from a qualified illuminating engineer—your electric-service company has one. Or trained G-E sales engineers will give you complete lighting recommendations. Just write or call the nearest G-E office. General Electric Company, Schenectady, N. Y.



Sodium luminaires are recommended for loading platforms because of their 180-degree, horizontal light distribution and high efficiency. Low lamp brilliancy prevents objectionable glare even at the low mounting heights.



Form 79 luminaires are recommended for lighting property lines because of their light-distribution pattern. Deflectors within the globe, or glass refractors, redirect a large portion of the light within the fence line.

GENERAL ELECTRIC

BETTER LIGHT MEANS BETTER PRODUCTION

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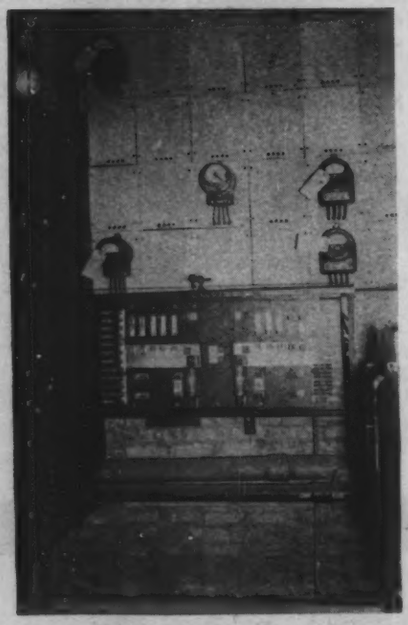
SINGLE-PHASE, air-cooled transformers step down feeder riser voltage at load centers in Chicago Furniture Mart. Increased riser voltage boosted current capacity of system and avoided expensive recoppering



FLEXIBILITY has been built into the electrical cabinets at transformer locations Note fuse clip arrangement that permits cartridge ranging from 30 amp. to 400 amp. in size to be inserted in branch circuits. Note also neat transite meter board and plug fuse panel at left

into which the floors of the Mart are divided for rental was equipped with ten ceiling lighting units using 200-watt lamps. While this was modern lighting at the time the Mart was first built, progress in the lighting field has led tenants to increase lamp sizes until many are now using 500-watt lamps. Lack of feeder capacity to carry this increased load and the resulting low voltage condition demanded attention.

Feeder risers from the basement vault originally operating at 230 volts, single phase, distributed energy to the various floors. On each floor autotransformers were used to secure 115-volt, three-wire distribution at the load. The "floating" neutral of the three-wire system required delicate balancing of load on the two legs of the system and its elimination was one of the desirable objectives of the change.

To put the new system in operation taps on the main supply transformer in the basement of the Mart were changed to bring feeder riser voltage up to 460 volts. Fuse clips on the main switchboard were changed from 230 to 460 volt sizes. At the distribution centers on each floor the 500,000-circ.mil feeder risers were brought in to the primary of 75-kva., 460–230/115-volt single-phase, air-cooled, step-down transformers. Branch circuits tapping the 115/230 volt, three-wire distribution circuit supplied the various tenant "sections." The neutral of the new three-wire system, however, was solidly connected to a ground bus that ran down through the building to a ground in the basement, entirely eliminating the "floating" ground that previously existed.

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Flexible Mounting for Capacitor Jobs

The adaptability of capacitors of various makes and sizes to varied locations in all types of industrial plants undergoing power-factor correction is a major factor in their success. This point is important in modernizing factory distribution circuits for maximum production under present defense conditions. The determination of electrical requirements is no more fundamental than the decision as to location and mounting of corrective units. Maximum utilization of plant circuits puts off the day of adding new copper and other material, but internal conditions in factories often put a premium on space for even non-rotating equipment.

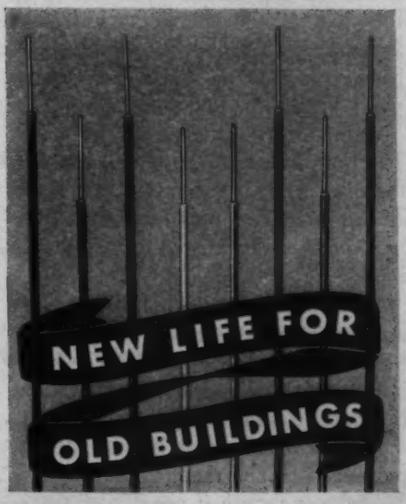
In the two cases illustrated are seen the adaptability of capacitor design to a relatively old shop and a newly modernized plant. In the old shop an Electric Machinery Company unit installed to correct the power factor of an induction motor mounted on the ceiling beam a few feet distant is supported behind a belt drive above the floor under excellent conditions for ventilation, angle-iron brackets holding the unit in place. In case additional capacitance should be needed later, this can be added easily in sections without encroaching on useful productive space in the plant. The electrical requirements can be met at minimum cost mechanically, a point of importance in millwrighting, and replacement is a matter of but a few moments.

The second installation shows a Westinghouse 90-kva. unit of the floor-mounted, inclosed type, with a double tier of condenser cans, complete screening to protect the equipment and employees from accidental contacts (575-volt circuits), and flexible armored conduit wiring.

OVERHEAD UNIT adapted to old shop (above). Protected unit for floor-mounted application (below)

G-E Wiring Materials Help Provide EFFICIENT FACTORY LIGHTING

Good wiring is essential for the modern lighting that factories require for fast, efficient production. Wiring systems in new plants should be adequate for lighting requirements. Wiring systems in old plants in most cases should be made heavier. All of the wiring materials needed for good lighting are in the G-E line.



FLAMENOL* BUILDING WIRES
(For Rewiring Existing Raceways)

This new small diameter synthetic-insulated wire enables existing raceways to be rewired inexpensively. Simply replace existing wires in conduits with Flamenol Building Wires of larger capacity. Effective copper can be increased as much as 400 per cent in some instances. This wire is available in sizes 14 to 4/0 and is approved by the Underwriters' Laboratories.

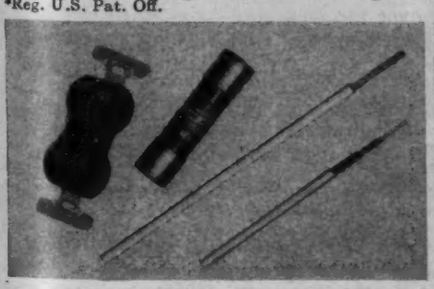
G-E CONDUIT, WIRE AND CABLE, WIRING DEVICES

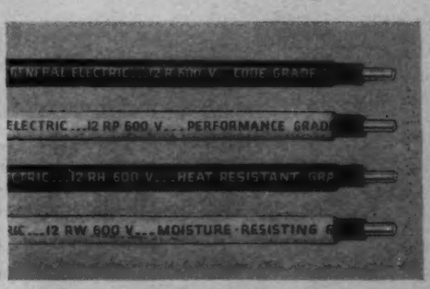
G-E White rigid conduit is hot-dipped galvanized and Glyptal-coated inside and out. Other G-E conduit products include flexible conduit, E.M.T., BraidX, BX, boxes and fittings. The G-E rubber-insulated wire and cable line includes Types R, RP, RH, and RW. The G-E wiring device line is complete including switches, lampholders, fuses, etc.

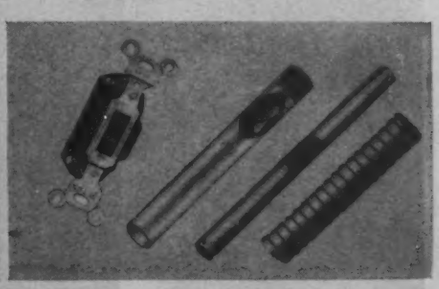
DELTABESTON WIRES

Deltabeston asbestos-insulated switchboard wire and Type AF fixture wire are especially designed for wiring lighting installations where heat is a problem. Deltabeston Switchboard wire will withstand inherent switchboard heat. Deltabeston Type AF Fixture Wire will resist the high-wattage lamp heat of modern lighting. It is approved for wiring all types of interior lighting fixtures.

*Reg. U.S. Pat. Off.







For further information about any or all of the G-E wiring materials see the nearest G-E Merchandise Distributor or write to Section G-0139, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut

GENERAL ELECTRIC

BETTER LIGHT MEANS BETTER PRODUCTION

LOAD BUILDING

Air Recirculated in Efficient Auto Oven

An enamel baking oven, heated by electricity and installed for Boulton Auto Rebuild of Seattle, Wash., has cut the time for drying a repainted automobile from 48 hours to one hour at a cost for electricity of 50 to 75 cents per car, according to Henry G. Boulton, who operates the business.

This oven, which was designed for the customer by H. Van Wyk of Puget Sound Power & Light Company, meets the conflicting requirements of driving off the volatile and conserving heat by combining air circulation with partial recirculation. Electricity has the advantage in this scheme of requiring no elaborate air-directing equipment.

The heating elements are placed in a box on top of the oven shown in the picture. Twenty-six Chromalox 2-kw. finstrip units are employed. A blower in one end of the compartment forces air down one side of the oven and through slots in the walls. The hot air moves cross-wise through the oven. Part is exhausted through a ceiling vent and part enters a chamber and is reintroduced at the blower intake.

Thermostats automatically provide an appropriate working temperature between 120 and 190 deg. F. Fresh air is filtered and humidity is maintained by water troughs along the oven walls.

With production at 100 to 140 repainted cars per month, about 5,000 kw.-hr. per month is consumed. Compared with air drying the electric oven permits more production and hence more sales, produces a harder surface and requires less dust-free space. Installed cost was about $470, and according to the owner: "The efficiency of the plant is proving entirely up to my expectations."

PUGET SOUND CUSTOMERS examine the harder, high-gloss finish they are able to turn out with this electric oven. At the right, inside, can be seen the air inlets and the water trough. Contactor and control switch on outside left wall

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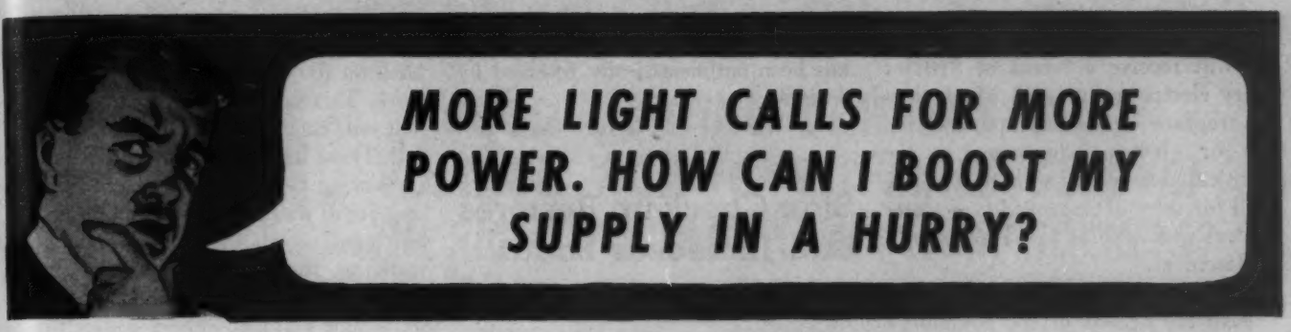
Pacific G. & E. Wards Off Bottled Gas

To combat increasing competition of "bottled gas" the Pacific Gas & Electric Company has established an experimental dealer co-operative range and water heater sales promotion plan in its Stockton division. The program incorporates several radical departures from previous P. G. & E. policy, including payment of a portion of the dealer's advertising costs, trade-in allowances in which the company participates and a bonus plan for dealers who sell approved appliances.

Electric range and water heater advertising ordinarily appearing over the company's signature will be increased and dealer advertising stimulated through a plan whereby the company will pay one-third of the cost of dealer's newspaper space. A fund of $2,500 has been set up, thus assuring at least $7,500 in dealer newspaper copy.

In order to qualify for participation in the plan dealers must agree in writing to sell only Underwriters' approved merchandise, to maintain a continuous display of at least two new models of ranges of 6-kw. capacity or more, to do the same with at least one new model automatic, insulated, storage-type electric water heater of not less than 3-kw., 18-gal. capacity and to do a reasonable



YOU CAN PUT PYRANOL TRANSFORMERS AT LOAD CENTERS AND CUT INSTALLATION TIME AND COSTS

FOR new lighting circuits, G-E Pyranol transformers make possible speedy installations at a saving, plus the economies of load-center power distribution.

1. Pyranol—the G-E insulating and cooling liquid—is noninflammable, and Pyranol transformers require no fireproof enclosing vault. They can be located almost anywhere in the plant, even on overhead beams. You save time and the expense of vault construction.

2. By putting Pyranol transformers at load centers you avoid long runs of secondary wiring, thus further reducing the cost of new circuits. Furthermore, shorter secondaries provide better voltage conditions and lower line losses.

A MODERNIZATION TIP

Frequently the capacity of your present wiring can be doubled or tripled by dividing it into short sections and installing a small Pyranol transformer in the center of each section. You avoid the expense of installing new secondary circuits. Savings up to 40 per cent have been made in the over-all cost of transformers plus feeders.

There's profit in load-center distribution with Pyranol transformers. Get complete information from the nearest G-E distributor or G-E Office. General Electric, Schenectady, N. Y.

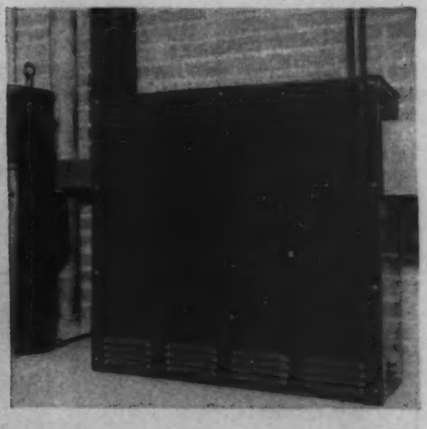
SAVED $500 ON LOAD-CENTER INSTALLATION

"We saved $500 on installed cost by using a Pyranol transformer to supply a lighting load," says R. H. Lewis, electrical superintendent, Motor Wheel Corporation, Lansing, Mich. No vault was required; installation time was materially reduced; valuable floor space was released because the transformer was installed on an overhead platform. Transformer rating: 100 kva, 480–240/120 volts

SAVED 40 PER CENT

Up near the ceiling, out of the way, here's one of three Pyranol transformers that brought savings of 40 per cent in the cost of modernizing a factory lighting circuit. When lighting was stepped up, the capacity of the existing wiring was increased by dividing it into three sections and installing a small Pyranol transformer at the center of each section. Rating of transformers: 100 kva, 2300–230/115 volts

SAVE WITH AIR-COOLED TRANSFORMERS, TOO



Located at a load-center, this G-E air-cooled transformer provides savings similar to those obtained with Pyranol transformers. Installation was simple, quick, and inexpensive. G-E air-cooled transformers are particularly well adapted to applications on circuits below 600 volts. Rating of the transformer illustrated: 50 kva, 480 to 120/208Y volts

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amount of advertising. Qualified dealers will receive a bonus of $10 for every electric range sold which does not replace similar company-served gas or electric equipment at the identical location. A $5 bonus will be paid for sales of approved type water heaters with similar restrictions as to replacement.

In addition qualified dealers will receive the benefit of the company's display service. Arrangements will be made for the preparation and installation of an electric range window display once every six weeks for each dealer without charge.

Trade-in allowances, of which the company will pay one-quarter, have been set at a maximum of $20 for ranges, unless the appliance has resale value in excess of that amount. A $5 allowance is made for obsolete electric water heaters or furnace coils and $10 for a "bottled gas" heater. Appraisals in which the company participates are made by its own personnel.

Special terms have been provided to finance wiring costs. The company will carry wiring contracts with no down payment, no carrying charges, a minimum monthly payment of $1 and a maximum term limit of 36 months.

Company home service representatives will be available for follow-up of all dealer or company range sales. They will also handle cooking or baking complaints and be available for conducting small cooking demonstrations before selected groups.

The program is to extend through 1940 and since its announcement it has been enthusiastically received by dealers.

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Sign Check-up Restores and Increases Loads

By R. B. BROWN, Jr.
Illuminating Engineer Boston Edison Company

To insure full service of signs and maintain their normal energy consumption we started a campaign last fall better to acquaint users with their operating conditions in connection with such lighting display work. A company photographer travels through a neighborhood, and when an electric sign is observed in use with burned-out lamps or open-circuited lettering a picture is taken showing the state of the sign. This is pasted on a single-page letter calling the user's attention to the "candid camera" shot of his sign; to the need of attention to secure full service from the investment, and carrying an attached postcard for return to us for information about maintenance costs. The company does no sign maintenance work and sells no signs, but promotes such activities in co-operation with contractors and manufacturers.

A representative of the company calls on the customer on receipt of the postcard and an estimate is given him as to the cost of putting the sign in proper shape. The first 28 letters resulted in eight return cards and five sign jobs representing 3,000 watts back on the line, with $200 in repair work. This year 62 letters have been sent out, each followed by a personal call. These have led to fifteen customers having necessary work done, putting 7,550 watts back on the line and representing about $700 worth of work to the sign companies. Ten customers asked for sketches for new signs and eighteen others asked for maintenance estimates. Twenty-four prospects for later work were obtained. In case of no reply a follow-up letter and card are sent within ten days.

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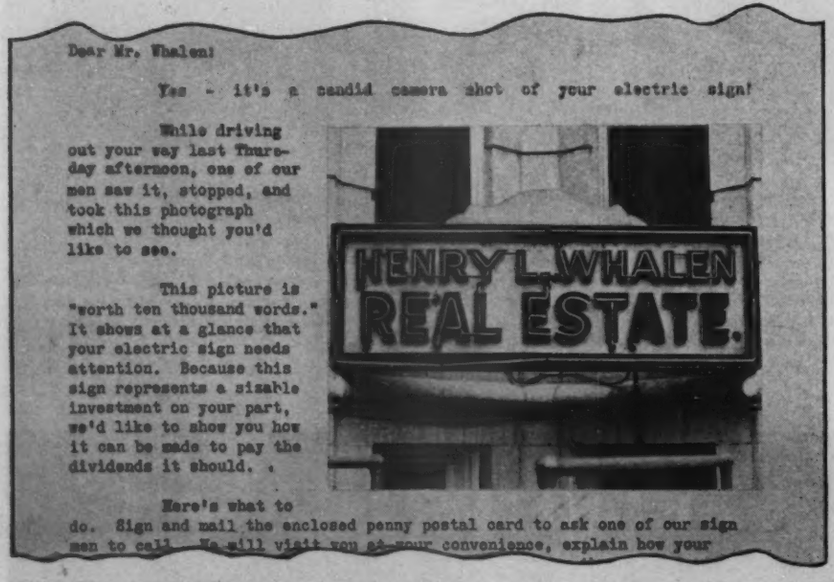
Duke Marketing Plan Sells Portable Ovens

By JOHN PAUL LUCAS
Merchandising and Advertising Manager, Duke Power Company, Charlotte, N. C.

One of the appliances which gives more than usual promise of helping to convert the low-use utility customer to a profitable customer is the portable electric oven recently placed on the market by Landers, Frary & Clark. We placed this oven in our line of appliances shortly after it was put on the market in 1938. During the balance of that year a total of 66 ovens were sold. Last year, through October, 207 ovens were sold on our system.

Before placing this oven in our line we had various tests run by our home economists, who said that, within the limits of its size, the oven would do anything that the oven on a standard electric range would do. Satisfied as to its performance, we established prices and placed it in stock at all of our branches.

We did not think that the previous job we did in getting this appliance into the hands of our customers was at all commensurate with the value and importance of the appliance and the market which we felt legitimately existed for such an appliance. We were fairly well able to determine that one fault was that many members of our sales organization either were not as thoroughly sold on the appliance and the market as the circumstances justified, or they felt that the sale of this oven, with a comparatively small commission, might prevent the sale later of a standard electric range with a much higher commission. We set about remedying this;


Dear Mr. Whalen:
Yes - it's a candid camera shot of your electric sign!
While driving out your way last Thursday afternoon, one of our men saw it, stopped, and took this photograph which we thought you'd like to see.
This picture is "worth ten thousand words." It shows at a glance that your electric sign needs attention. Because this sign represents a sizable investment on your part, we'd like to show you how it can be made to pay the dividends it should.
HENRY L. WHALEN
REAL ESTATE.
Here's what to do. Sign and mail the enclosed penny postal card to ask one of our sign men to call. We will visit you at your convenience, explain how your

TELLS THE CUSTOMER his sign needs attention

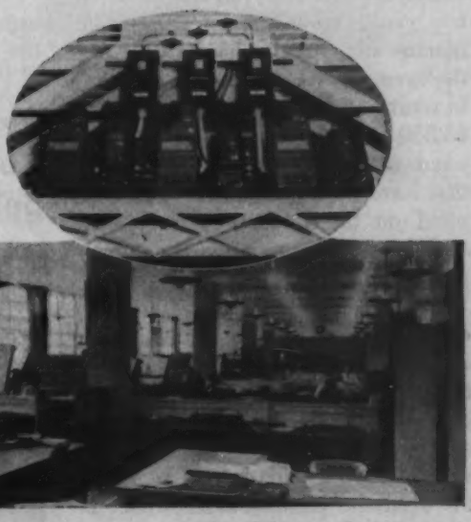
GOOD LIGHTING DEMANDS GOOD VOLTAGE. HOW CAN I MAKE SURE OF THE RIGHT VOLTAGE AT MY LAMP SOCKETS?

KEEP VOLTAGE—AND LIGHTING—AT CORRECT LEVELS WITH THIS NEW, LOW-PRICED G-E REGULATOR

PROPERLY regulated voltage on your lighting circuits can pay big returns through higher illumination, and consequent higher production, because *when voltage drops off, light levels drop much more.* That's why G-E automatic air-cooled induction regulators are finding increased use as reliable, low-cost aids to better lighting.

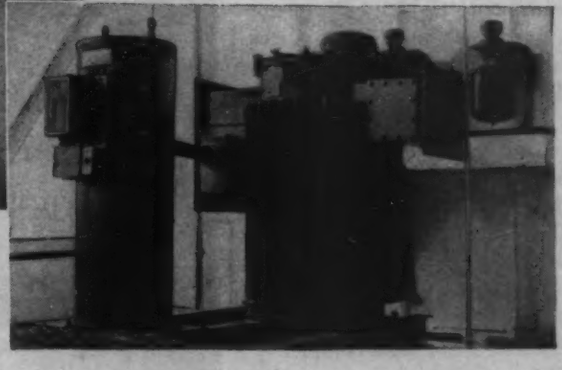
The compact design and light weight of these units make possible simple, space-saving installations. They can be installed almost anywhere indoors—even in basement or attic—without a fireproof vault. Regulation is smooth and accurate; ratings run from 1.2 to 12 kva, 120 to 600 volts—automatically operated (manual or motor operation also available). First cost is surprisingly low—and maintenance is practically negligible.

Call our local representative now—he'll be glad to help you select the proper regulator to keep your lighting *up*. General Electric, Schenectady, N. Y.



Tucked away on an overhead beam, this compact installation of three 1.5 kva, Type AIRS automatic induction regulators corrects the voltage drop on the long, heavily loaded feeders that supply power for the modern, indirect lighting of this large industrial engineering office.

Top-notch voltage for top-notch illumination is assured in this large eastern manufacturing plant by a G-E Type AIRS induction regulator. Valuable space was saved because the regulator could be placed overhead on a rack beside a G E Pyranol transformer.



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GENERAL ELECTRIC

BETTER LIGHT MEANS BETTER PRODUCTION

demonstrations were held for the salesmen by our home economists and small sales meetings followed, in which the appliance and the market for it were discussed in detail. We ascertained that the lack of a suitable table for the oven had prevented some sales, so we purchased a number of suitable porcelain enamel tables and made a special price of $32.50 to include the table instead of the standard price of $29.95 for the oven alone.

Trade-in Allowances

In working out a campaign set-up for the customer we made a proposal that should any purchaser of an oven desire to purchase a full-size new electric range at any time within four months after the purchase of the oven the oven and table would be accepted in return at the full purchase price of $32.50 and the amount of the cash payment with the monthly payments that have been paid in would be applied on the contract price of the electric range purchased at regular price.

Should any purchaser of an oven desire to purchase a full-size new electric range at regular price at any time after four months and not over eighteen months from date of purchase of the oven a reasonable allowance would be made for the return of the oven and table, said allowance in no case to be less than $20 from the installed list price of the range.

We felt that it was very important that every installation should be properly made and that the circuit upon which it was to be used should be of adequate capacity to take care of not only the oven itself but of hot plates that would so often be used with the oven. If a new circuit had to be installed that installation could be added to the contract price of the oven and paid for through the same extended terms offered on the oven itself. These terms were $2.50 cash —balance $2 per month for fifteen months, 5 per cent discount for cash.

The salesmen who were most thoroughly interested and most completely sold did a very good job in our activity and demonstrated that there is a market for the appliance and that the average salesman can do a good job for himself as well as for his company in selling it.

One noteworthy fact in connection with our sales of the Universal oven has been that the canvassing incident to its sales has resulted in many instances in the sale of standard electric ranges.

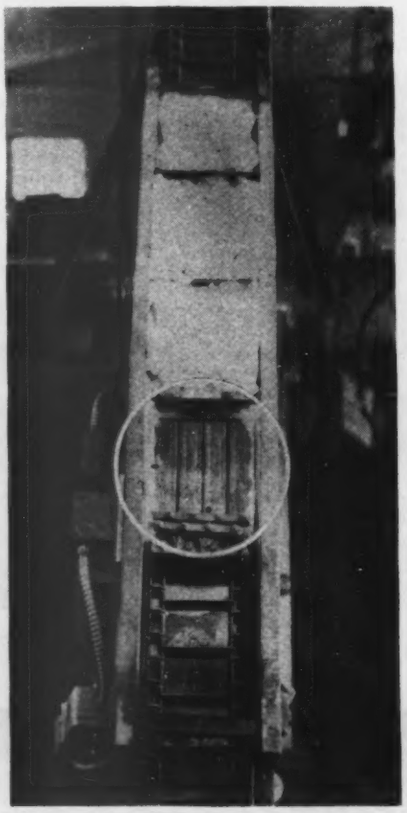
Two things lead us to believe that our sales of this appliance should be much greater from now on. Our salesmen are more thoroughly sold on the appliance and have a greater appreciation of its value and importance; also, a fuller realization that their earnings need not be decreased by putting time and effort on this appliance as compared with the time and effort put on the so-called major appliances. The second thing is the background of satisfactory experience by the customers on our lines who have been using them for some time. Most of these customers are quite enthusiastic over the use they have got from the appliance.

•

Develops Continuous-Belt Soil Sterilizer

By LUCAS S. CAPLE
Rochester Gas & Electric Corporation,
Rochester, N. Y.

The idea of using sterilized soil for plant growth is not new, but here is a new method of doing it that has worked out very satisfactorily in one installation.



TOP VIEW of sterilizer showing belt and one section of 1,500-watt strip heaters

The Joseph Harris Seed Company, Rochester, N. Y., grows thousands of plants each year for resale at its stand and for its own use to obtain seeds for the coming year. Before purchasing or building a soil sterilizer it investigated very thoroughly many different ways of doing it and also the kind of equipment available. After several conferences it was decided that electricity was the best form of heat due to the ability of easy control and that the belt type would tend to save labor.

Construction Details

The machine was built of 1½-in. angle iron with a steel plate 6 in. wide which was used to carry the dirt. Six kw. of strip heaters were placed below the plate to heat the bottom and 6 kw. was placed about 2 in. above the plate to supply overhead heat. The dirt was drawn over the plate by two chain belts with ½ in. band iron brazed between every other link. A belt speed of approximately 7 ft. per minute let the dirt discharge into sterilized flats at a temperature of about 170 deg. The dirt was mixed and ground before entering the machine so that large chunks and stones were eliminated.

Some trouble was experienced in the hopper for feeding the soil into the machine as it would pile up and arch over, but by opening the throat on the hopper this was eliminated.

Very little insulation was used, and I feel that by properly insulating the machine it would be possible to increase the width of the belt to possibly 12 in. or to decrease the amount of heat required.

Four 30-in., 1,500-watt, 220-volt strip heaters were used above and below the plate, but they operated on a 208-volt circuit, therefore the amount of demand was less than 12 kw. A ⅓-hp., 1,200 r.p.m. motor was direct connected to a 60–1 gear ratio for power on the belt.

The company is starting the second season with this machine and has put through approximately 7,000 flats to date and is very well satisfied with the results obtained. Labor saved in weeding alone more than pays for the current used, to say nothing of receiving more plants of a better quality for market.

G.E. HAS A GOOD LIGHTING STORY, BUT WHAT DO I DO ABOUT IT? WHAT IS THE FIRST STEP?

General Electric Will Help Improve Your Lighting Quickly

HERE'S the way to go about it: If you want descriptive information on some of the products presented in the preceding pages, check them off on the large coupon and mail it immediately. Or if you wish, telephone or write the nearest General Electric office. Most G-E sales engineers have a good working knowledge of industrial lighting. If your conditions require a special analysis, they can put you in touch with General Electric specialists on outdoor and interior lighting, and on power distribution including voltage regulation, wiring, and protection. Or, they may refer you to a G-E distributor. Most likely, the economical answer to your particular lighting problem can be obtained quickly and with little trouble to you. Go after it today!

CHECK THE INFORMATION YOU WANT— MAIL THE COUPON TODAY

General Electric Company,
Section A 451-18,
Schenectady, New York

Gentlemen:

Please send detailed information on the products checked:

LAMPS

- ☐ Filament
- ☐ Fluorescent
- ☐ Mercury
- ☐ RF Fluorescent

FLOODLIGHTS

- ☐ GEA-3440—Lighted Yards Say "Keep Out"
- ☐ GEA-3311—Type L-68 Spun-aluminum Floodlight
- ☐ GEA-3050—Type L-43 and L-49 Spun-aluminum Floodlight
- ☐ GEA-1865—Novalux Floodlights
- ☐ GEA-3288—Novalux Sodium Luminaires
- ☐ GEA-2276—Novalux Form 79 Luminaire

BALLASTS

- ☐ GEA-3293—Ballasts for Fluorescent MAZDA Lamps
- ☐ GED-855—Transformers for MAZDA H (Mercury) Lamps

WIRING

- ☐ Adequate Wiring for Industry
- ☐ Flamenol Small-diameter Building Wire
- ☐ Deltabeston Asbestos-insulated Wire
- ☐ Conduit Products, Wire and Cable, Wiring Devices

TRANSFORMERS

- ☐ GEA-3377—Ways to Save with Load-center Distribution of Electric Power
- ☐ GEA-3180—Load-center Transformers Aid Factory Lighting
- ☐ GEA-2048—Pyranol Transformers
- ☐ GEA-897—Air-cooled Transformers

INDUCTION VOLTAGE REGULATORS

- ☐ GES-2285—What's the Answer When Poor Voltage Hampers Production?
- ☐ GEA-3057—Air-cooled Induction Regulators

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

451-18

BETTER LIGHT MEANS BETTER PRODUCTION

GENERAL ELECTRIC

NEW ENGINEERING IDEAS

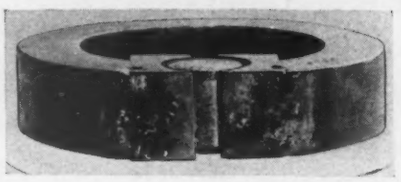
Carbon Arc Welding of Meter Magnets

A new procedure, involving carbon arc welding of the pole pieces and magnet of D'Arsonval type meters as an integral unit, has made possible marked improvement in the quality of such equipment and notable simplicity of production.

The new method, a development of the Hickok Electrical Instrument Company, is regarded as an advance over the use of die-cast pole pieces or any construction in which the pole pieces are a part of the movement. Spot welding proved unsatisfactory because it produced excessive heat in the magnet, which annealed the metal and resulted in the loss of permanent magnetic properties. Frequently, scrap losses resulting from this cause and from magnets cracking due to the crystallizing effect of the excessive heat amounted to as much as 35 per cent.

Welding by the carbon arc method does not affect the magnetic properties more than one-half of 1 per cent. The work consists simply of welding two small corners; quick concentration of heat in the carbon arc confines the welding to a small area, preventing excessive heating of the metal. Only two seconds is required for the welding of each unit, a time-saving advantage over the conventional procedure.

Cost savings of 30 per cent are obtained from this procedure; largely because a stamped instead of a cast frame is used and a construction in which the pole pieces become a part of the magnet and not of the movement assembly. Another contributing factor was the replacement of hand tapping by automatic screw machinery for threading parts.



Lincoln Electric Company

POLE PIECES are welded to magnet with carbon arc method in two seconds
Welding is done with a Lincoln 150-amp. motor-generator type of arc welder, using a 5/32-in. carbon with a long taper. Small tack-weld at junction of pole pieces to inside periphery of magnet is made with 50 volts and 50-55 amp.; seam is welded with magnets on end at 45 volts and 75 amp. Liquid soap, applied to the parts prior to welding, produces gas, which shields arc and metal from surrounding atmosphere, preventing oxides and nitrides. Welded pole-and-magnet assembly (bottom) is machined and moving element and frame then are added.

An important contribution of this new method from the standpoint of quality is the perfect circular opening obtained—necessary to assure accurate readings. This results from reaming of the circular portion after welding, which was not possible with other type construction.

•

Portable Equipment for Weld Inspection

By VICTOR HICKS
Industrial X-Ray Engineer
Westinghouse X-Ray Company,
Long Island City, N. Y.

Two self-contained power units, operating from a 220-volt a.c. supply, or from a gasoline-driven a.c. generator, each employs a circuit containing a high-voltage transformer, a capacitor, electronic valve tube and a valve tube filament transformer, to produce 220 kv. d.c. in this mobile industrial radiographic unit.

By means of illuminated dials on the control board, the high potential is adjusted in 2-kv. steps from taps on an auto-transformer. To prevent any large surges on the X-ray tube, the low voltage is applied to the primaries of the high-voltage transformers through a series of resistors which are removed from the circuit by an electric motor.

The time the film is exposed to the X-rays is controlled by a lead shutter on the X-ray tube. When the voltage on the primaries of the high-potential transformers has reached the predetermined value for the work at hand the shutter is automatically opened by a relay. At the same time an electric interval timer, previously set for the desired exposure time, is started. At the completion of the exposure this timer operates a relay

You can have

THE RIGHT LINK *at the* RIGHT PLACE *at the* RIGHT TIME

KEARNEY'S *Precision Built* FUSE LINKS

THERE are many reasons why so many operating men are using Kearney Fuse Links. Whether they specify the new Type 200, the Quik-Action Fitall or the Trip-O-Link Fuse, they find they get the dependability expected of a precision built link. With such factors as adaptability, strength, temperature, durability, accuracy and speed carefully considered in their design, these links assure efficient switch performance. And now ease of handling, storing and dispensing have been added to other features to give even greater value, at no extra cost.

features of the NO. 12165-B FUSE LINK DISPENSER

See from the ground whether you have links on the pole ready to handle an emergency. Pul Tabs of Kearney Fuse-Paks tell you.

Keep your fuse link coordination schedules accurate with a supply of proper amperage sizes right on the pole.

You might have the right link on your storeroom shelf, but why not have it at the point of use—in a pole-mounting fuse container?

Using KEARNEY FUSE LINK DISPENSERS

COMBINED WITH NEW PUL-TAB FUSE-PAK

At the right, the new Kearney Pul-Tab Fuse-Pak. Contains 5 fuse links, each packed in individual weather-resistant bags, each bag having a "pul-tab" clearly marked with amperage rating of link.

Above, the new Kearney Fuse Link carton for easier storeroom handling contains 5 Pul-Tab Fuse-Paks, 5 links to a Pak, 25 links to a carton. Each carton carries information on primary fuse sizes for distribution transformers.

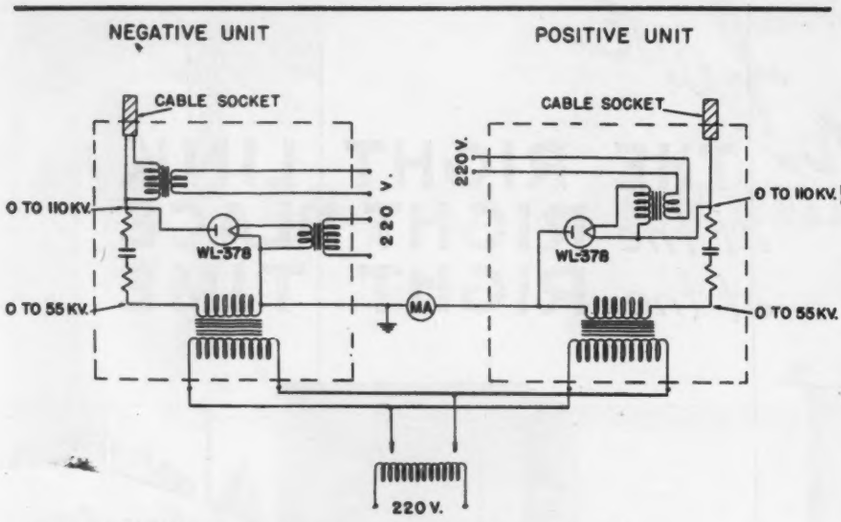
NOW—minimize the risk of upsetting your fuse link coordination schedules—the hazards of over-fusing—unnecessary delays in restoring service. Assure these advantages by installing, right on the poles, at important switching locations, a Kearney Fuse Link Dispenser which is specially designed to hold a Pul-Tab Fuse-Pak containing five proper links.

After all, for convenience and emergencies, you want the right link at the right time, at the point of use—and reserve links, of course, on your storeroom shelves.

all Kearney Links packed in Pul-Tab Fuse-Paks

Whether or not you use the No. 12165-B Fuse Link Pole Dispensing Boxes which, incidentally, cost only 49c each, take advantage of the handy Pul-Tab Fuse-Paks and handy cartons of 25 links, the standard package for all Kearney Links, at no extra cost.

JAMES R. KEARNEY CORPORATION
4236-42 CLAYTON AVENUE - ST. LOUIS, MO.
Canadian Plant - Toronto, Canada



TWO SELF-CONTAINED power units operate from 220-volt supply

Voltage induced on each capacitor by high-voltage transformer acting through valve tube is added to that produced by each transformer itself, so that high voltage on output terminals fluctuates sinusoidally between 0 and minus 110 kv. on negative unit and between 0 and plus 110 kv. on positive unit, and these units together produce maximum potential difference of 220 kv., which is supplied to X-ray tube through two cable sockets.

FLEXIBILITY marks this mobile industrial radiographic unit

X-ray tube may be moved 4 ft. horizontally or vertically and tube head may be swiveled through 260 and 360 deg. about the same axes, respectively. Equipment may be lifted on its four-wheel rubber-tired truck by crane. Tube can be removed from its support and operated up to 50 ft. away from running gear. If necessary, component parts of machine can be lifted from chassis and reassembled at desired site. Using target-to-film distance of 36 in. and maximum voltage—220 kv.—this equipment can radiograph through 3 in. of steel in three minutes or 2¾ in. of steel in one minute.

to open the primary circuits of the high-voltage transformers.

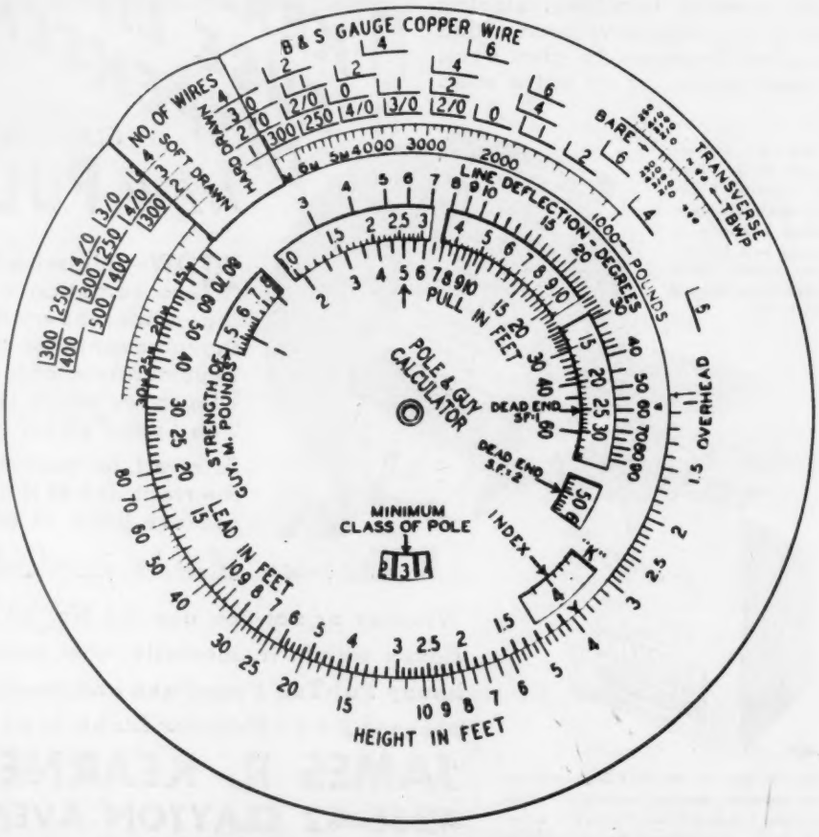
Circulating oil, cooled by passing it over pipes through which water runs, removes heat from the tube. The high voltage is fed into the X-ray tube through flexible cables insulated for 110 kv. each; external surfaces of these cables are covered with a grounded metallic sheath. The exterior of the tube housing is covered with a lead coating to prevent escape of the unwanted X-rays; useful X-rays are confined to the desired area by a hollow lead cone. Leaded control booth is provided for the operator.

Determines Pole Class and Guy Size

Proper size of overhead or down guys for dead-ends or any angle in the line may be determined with this device. It also determines the proper class of poles (A.S.A. classification) to withstand transverse loads due to ice and wind and longitudinal loads due to broken conductors.

This calculator is based on hard or soft drawn copper stressed to 50 per cent ultimate. By making one additional operation the same information can be determined for 60 per cent ultimate and for A.C.S.R. conductor. Other conductors can be substituted if the allowable tension is known.

Calculations for pole class are based on class B loading of the "heavy" loading district as defined by the National Safety Code. Complete calculations for poles and guys at railroad crossings can be made on the device. A patented device, the calculator may be obtained from W. W. Mayfield, Jefferson City, Mo.



CALCULATOR DETERMINES proper pole class and guy sizes for dead-ends or angles

Dependable grounds, YEAR AFTER YEAR

The thick copper exterior of a Copperweld rod, permanently molten-welded to the stiff steel core, prevents rusting—year after year. And, when a copper ground wire is clamped to a Copperweld rod with a Copperweld clamp, there are no dissimilar metals in contact—no galvanic action—and no electrolytic corrosion. For dependable grounds, year after year, make sure you have non-rusting rods and friendly metals in contact under the ground, by specifying Copperweld ground rods and clamps.

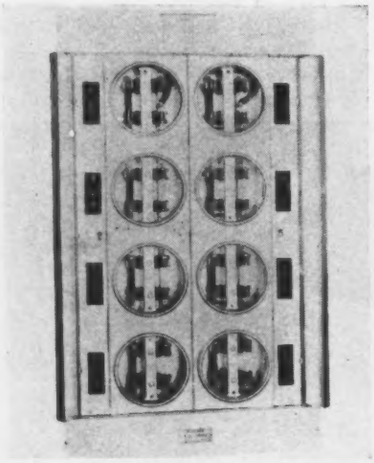
COPPERWELD STEEL COMPANY, GLASSPORT, PA.

COPPERWELD *Non-rusting* GROUND RODS AND CLAMPS

NEW EQUIPMENT

Meter Channel

Circuit breaker meter channel is announced for residential buildings and commercial structures. Socket-type meters and



Indoor multiple meter channel. **Westinghouse Elec. & Mfg. Co.**, East Pittsburgh, Pa.

circuit breakers are housed in the channel. Indoor units may be flush or surface mounted; outdoor units are provided with a raintight cover. Channels are assembled and wired at the factory.

•

Room Heater

"Everhot Ray-Vector" heater; 1,320 watts. **Swartzbaugh Mfg. Co.**, Toledo, Ohio.

New electric room heater can be converted from radiant to circulating air heater by foot-pedal damper-deflector which diffuses or concentrates heat rays as desired. Safety switch turns current off if the heater is accidentally tipped over.

•

Dual Voltage Switch

Type "CH" dual voltage switch; designed for 220-440 volts of delta-connected motor; available also for 220-440 volts wye, 380-220 wye-delta. **Wilson Welder & Metals Co.**, 60 East 42d St., New York, N. Y.

Dual voltage switch is announced for installation on arc welding machines when they must be used on either of two line voltages at different times. It can be used on any a.c. motor provided motor and starter are reconnectable for two voltages. Device reconnects stator winding and also adjusts holding coil of magnetic starter and heater relays.

•

Solder Pot

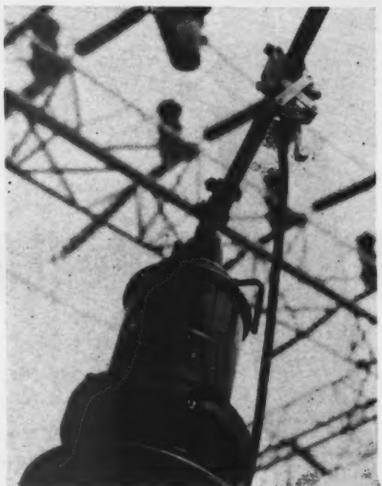
Automatic miniature solder pot; 75 watts; for either a.c. or d.c. **Vulcan Electric Co.**, Lynn, Mass.

Cast-iron solder pot holds 1¾ ounces of 50/50 solder. Insulated against loss of heat, the pot also has adjustable thermostatic heat control.

•

Grounding Clamp

Versatility is feature of this new clamp for safety grounding on oil circuit breakers, transformers and other station equip-



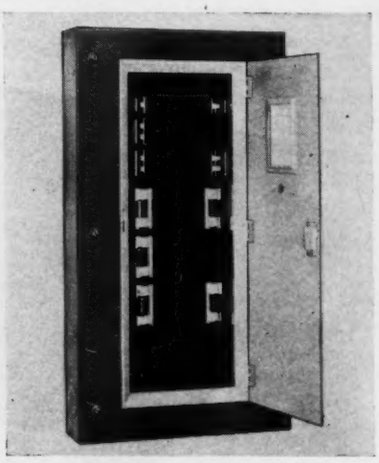
"Versi-Tap" clamp; jaws accommodate a large range of conductor sizes; with separable or attached grounding sticks. **Memco Engineering Co.**, Long Island City, N. Y.

ment. Parallel jaws enable device to be clamped over cable, tubing or bar at any angle. Serrated clamping surface assures positive grip.

ELECTRICAL EQUIPMENT BUYERS look first in "Electrical World" *Electrical Buyers Reference* for names, addresses and products of manufacturers.

Panelboard

New distribution panelboard extends "Multi-breakeR" principle to include 100-amp, 230-volt branch circuit capacity for



Type "MH" distribution panelboard; branch breakers in 15 to 100 amp., 1, 2 or 3 poles, 115 and 230 volts, single-phase and three-phase a.c. systems. **Square D Co.**, Detroit, Mich.

power and lighting distribution. Breakers are common trip so they are suitable for use on ungrounded systems; single-phasing of motors protected by these circuits is said to be prevented. Panels are dead-front.

•

Limit Switch

Rotating-geared-type limit switch; contacts designed for 125-volt, 4-amp. a.c. operation and 125-volt, 1-amp. d.c. **General Electric Co.**, Schenectady, N. Y.

Small-size geared-type limit switch is announced for application on motor-driven devices where it is necessary to limit rotation of motor shaft or some rotating shaft or gear on driven machines.

•

Maintenance Aid

"P-95" pump; driven by 115-volt a.c./d.c. ½-hp. motor. **Blackhawk Mfg. Co.**, Milwaukee, Wis.

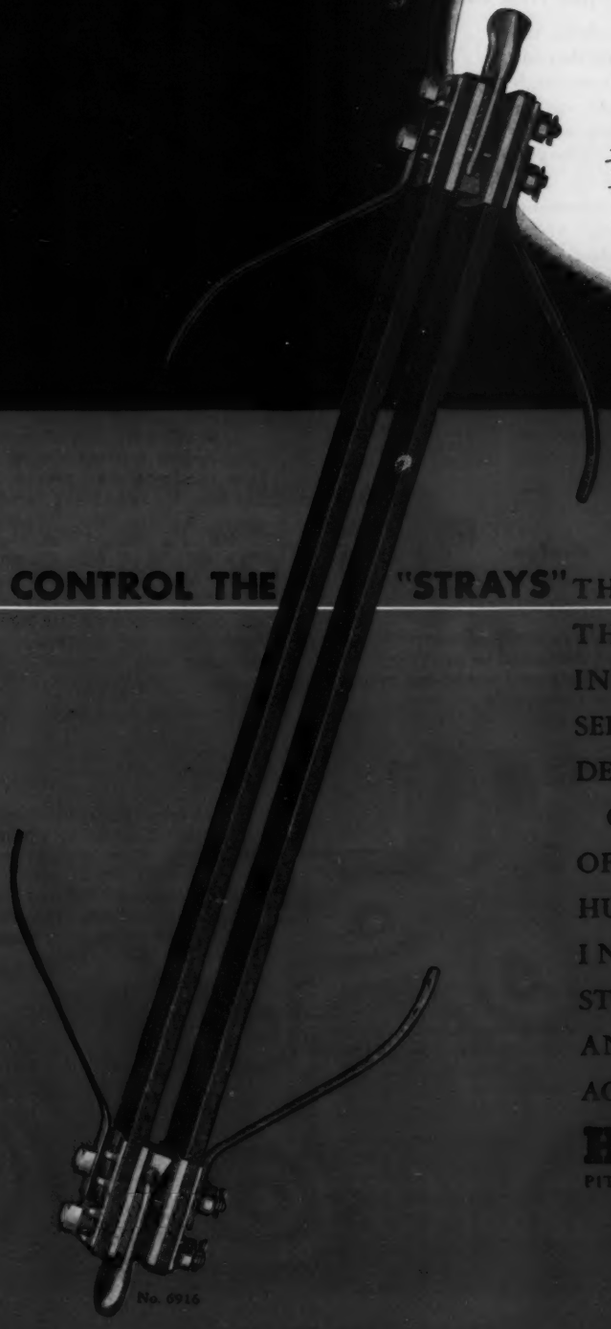
New developments in this company's "Porto-Power' line of hydraulic equipment for pushing, pulling, clamping, pressing, bending and spreading operations in-

"ROLLING STONES GATHER NO MOSS"

—SO CONTROL THE "STRAYS" THAT TRESPASS ON YOUR LINES!

THESE WANDERING SURGES THAT INTERRUPT YOUR SERVICE CAUSING SERIOUS DAMAGE AND COSTLY REPAIRS, DEFINITELY "GATHER NO MOSS."

CURB THE WANTON DESTRUCTIVENESS OF THESE "OUTLAWS" BY INSTALLING HUBBARD DUAL MEMBER WOOD STRAIN INSULATORS, DOUBLE PLANK STRUCTURES, WOOD CROSS ARM BRACES AND HUBBARD HIGH TENSION LINE ACCESSORIES!



HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND CALIFORNIA . . . CHICAGO

"HANG THE LOAD ON HUBBARD HARDWARE"

ion Made!

est Materials

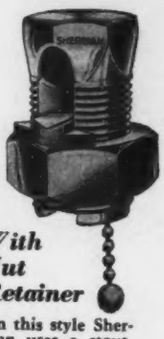
Assembly . . . Reliability

rising LOW COST!

akes a line of wire connectors that are designed and built specific needs of the light industry.
is made for fast assembly electrical efficiency. Exam- connectors. Compare them art with competing goods. for yourself then, why Sher- supplies such a large propor- connectors used in this field. too, Sherman connectors are low priced.

Split Bolt Connectors

Strong, clean, machine cut threads. Made from highest grade special alloy bronze, of greater tensile strength and greater corrosion resistance. Solid spacer that won't collapse, with greater bearing surface. Full hexagonal head. Long pilot. Two styles — with or without nut retainer.



With Nut Retainer

On this style Sherman uses a stout, kink-proof retainer that will stand a lot of rough handling. No radio interference. Ask for Bulletin No. 22.

Armor Rod Clamps

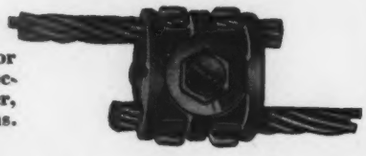
A new design for making tapoffs over ACSR Armor Rods. Cat. No. R1 for copper taps, Cat. No. R2 for ACSR or Galvanized Steel Strand Taps. Ask for Bulletin No. 25.

Wedge Grip Connectors

Made entirely of pure copper, and designed to provide extra wedging and snubbing action. Non-removable screw.

Jumper Clamps

ribbed, parallel groove clamp for poff, service or other wire connec- in a range of styles, for Copper, Galvanized Steel Strand connections. Ask for Bulletin No. 25



"Bondrod" Ground Clamps

A very popular type clamp, for driven ground rods. Made of heavy, extruded bronze. Bronze screw with cup point. Strong, one-piece construction. Ask for Bulletin No. 22.

H. B. SHERMAN MANUFACTURING CO.

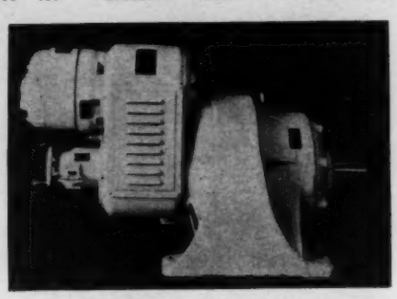
BATTLE CREEK, MICHIGAN

clude an electrically driven pump which can be used instead of the hand-operated type on all rams, from 4 to 50 tons capacity. New "Spee-D" coupler enables one pump and hose to serve all sizes of rams.

•

Variable-Speed Units

To provide more compact and smaller units, this company has added two types to its "Varidrive" line. Motors have



Types "VEV-GD" and "VEV-GT" Varidrive-Syncrogear units. U. S. Electrical Motors, Los Angeles, Calif.

double- and triple-reduction gears for low-speed drives. New construction does not require a sub-base for mounting, permits mounting of "Varidrive" case at any angle with respect to gear case.

•

Dead-End Clamp

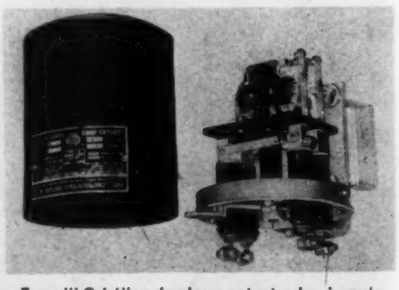
"Strateline" clamp; 15¼ in. long; cable range, 0.54 to 1.00 in. **Ohio Brass Co.**, Mansfield, Ohio.

Expanding its line of special clamps for dead-ending bus conductors in stations or line conductors at towers, this company has added a fourth and larger size. Clamps allow cable to pass through dead-ending device in a straight line, avoiding twisting of wire and clamp. Clamp can be connected directly to clevis-type suspension insulator, but socket and clevis fittings can be furnished for use when dead-ending conductors on transmission structures. Stringing loop is provided at one end of clamp.

•

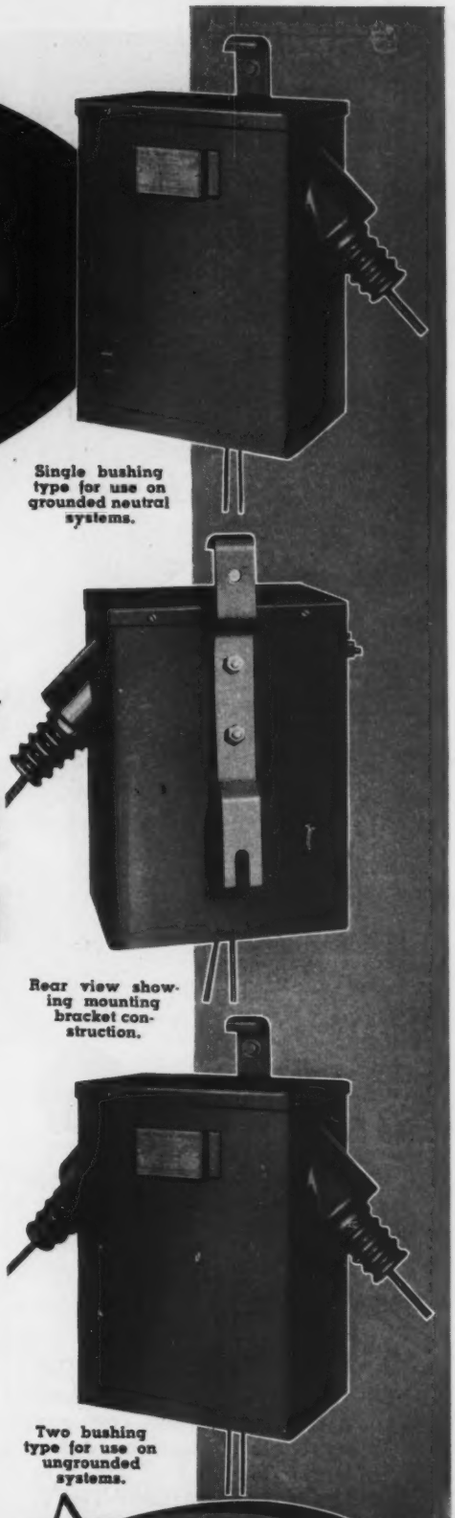
Relay

Series loop cutout sectionalizes open circuit faults in loops of series lighting circuits when open circuit fault occurs in protected loop circuit, short circuiting the loop to continue lighting in balance of circuit and disconnecting the faulty loop. Operation of relay rotates reset target on



Type "LC-6.6" series loop cutout relay in pole type case with crossarm bracket. **South Bend Current Controller Co.**, South Bend, Ind.

CUT DISTRIBUTION COSTS 50%



Single bushing type for use on grounded neutral systems.

Rear view showing mounting bracket construction.

Two bushing type for use on ungrounded systems.

With this NEW★ *Transformer Development*

★STANDARD TYPE-SRE DISTRIBUTION TRANSFORMER

The type SRE distribution transformer has been especially designed to enable utilities to serve the low demand customer economically.

Until recently the high installation service charge prevented the addition to systems of many customers of this type whose loads would have resulted in increased revenue.

Type SRE transformers are listed in the following ratings:

VOLTAGE	VOLT AMPERE CAPACITY
2400/4160Y—120	750
	1500
4800/8500Y—120	750
	1500
7200/12470Y—120	600
7620/13200Y—120	600

The construction and applications of the type SRE transformer are completely described in Bulletin S-302.

Send Today for Bulletin S-302 describing SRE Transformers

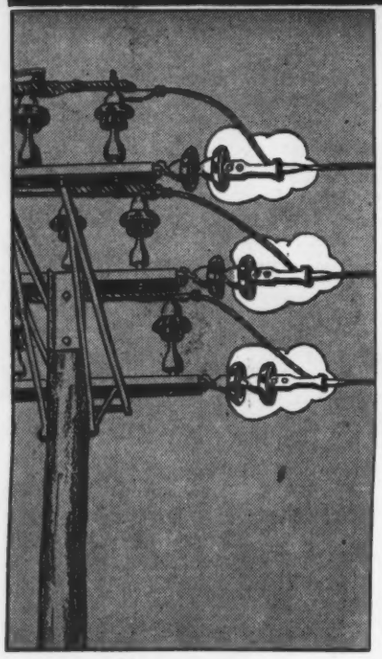
THE STANDARD TRANSFORMER CO.

WARREN, OHIO, **Representatives in Principal Cities**

Reliable ELECTR
OVER 30 YEARS SERVIC
CARROLL AVEN

features as the line Splice.

modernize
YOUR
DISTRIBUTION
PRACTICE—



Primary dead ending with

**Reliable
Straight-Thru
Dead Ends**

• RELIABLE STRAIGHT-THRU DEAD ENDS with rigid clevis make convenient, low cost and high strength connections to disc insulators. The end of the wire can be fed STRAIGHT-THRU the unit and used as a jumper. Hole in clevis enables the lineman to insert bolt for attaching rope blocks when pulling slack. The same design liable Straight-

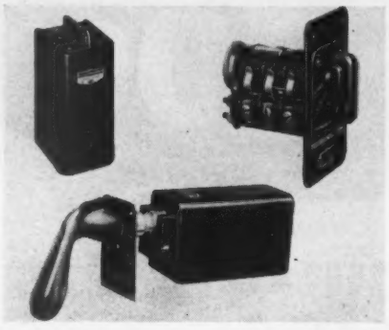
COMPANY
THE UTILITIES

lower base casting to afford identification of tripped position. Standard relay is adjusted to afford correct operation on 6.6-amp. series circuits with open circuit of not less than 1,500 volts.

•

Drum Control

Drum-type master switch provides three-wire control for machine tools and other equipment. Affording functions equivalent



Drum-type master switch; for pilot circuits to 600 volts a.c. and d.c. **Cutler-Hammer,** Milwaukee, Wis.

to two- and three-button heavy-duty push-button stations, it is offered for use where operating lever is preferred. By removing a stop post, drum can be converted from non-reversing to reversing.

•

Fluorescent Lamp Holder

Bakelite fluorescent lamp holder. **Kulka Electric Mfg. Co., Inc.,** Mount Vernon, N. Y.

An innovation of this unit is the "Sure Locking" feature. Lamp is removed by a simple push-button method. Plastic button is pushed down and the prongs of the lamp slipped down the slots of the holder. Lamp holder also has a tapped bracket.

•

Moisture Detector

Portable device determines percentage of moisture in wood as well as maximum moisture content of wood permissible. Both surface and sub-surface readings can be made and as many as twenty readings a minute may be obtained. Electrodes are plunged into the wood, instrument is "tuned" and readings made. Electrodes penetrating the surface do not deface the wood, the company states.

"Delmhorst" moisture detector; 8 to 24 per cent range; weighs 4 lb. **Colloid Equipment Co.,** 50 Church St., New York, N. Y.

•

TECHNICAL LITERATURE

TEMPLET—"Transmission and Distribution Materials," templet sheet for use in preparing drawings. A revised templet, it shows four suspension insulators, a Clamp-top pintype, thirteen other pintype insulators, and fourteen hardware items. All of the products are shown to six scales, from ¼ in. —1 ft. to 1½ in. —1 ft. Copies may be obtained from Ohio Brass Company, Mansfield, Ohio.

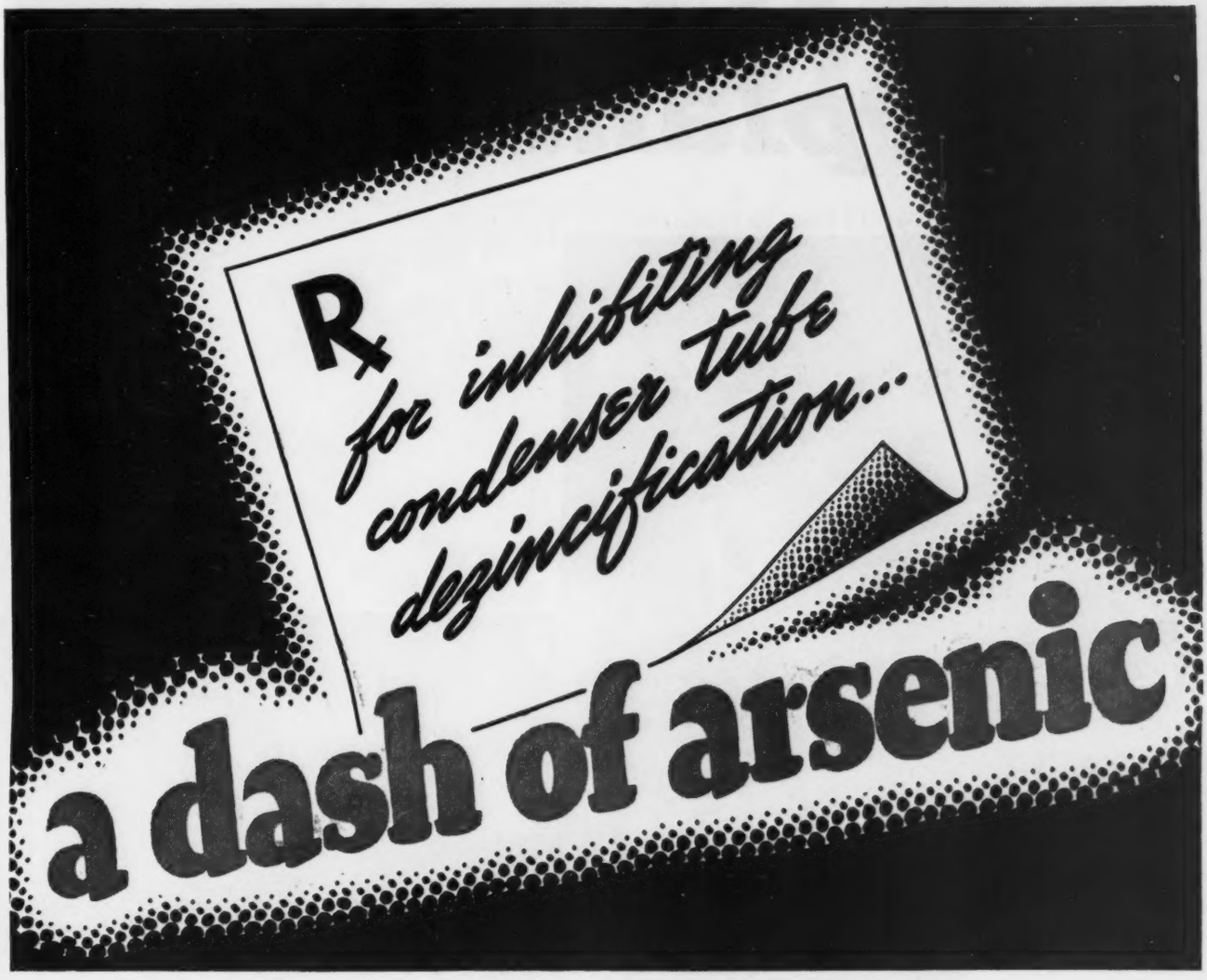
PORCELAIN ENAMEL—Standard available from the National Bureau of Standards, Washington, is a recommended commercial standard for porcelain enamel, exterior and interior, on domestic and commercial refrigerators. The purpose is to establish nationally recognized minimum standard specifications, which include inspection rules and methods of test for porcelain enamel on both exterior and interior of domestic and commercial refrigerators, for the guidance of manufacturers, distributors, dealers and users.

VAULT ALARMS—"Noise in Burglary-Resistive Vaults Under Normal and Attack Conditions" is a bulletin prepared for the purpose of developing new and additional data on the requirements for burglar alarm systems operating on the sound detection principle. Data are presented relating to the ambient sound energy levels in structures of varying construction and location; the sound energy levels developed during burglarious attacks of various kinds; and the characteristics of attack noises under the different conditions likely to be encountered in the field. Published in the July issue of the "Bulletin of Research" by the Underwriters' Laboratories, Inc., 161 Sixth Ave., New York City.

AIR SWITCHES AND BUS SUPPORTS—The American Institute of Electrical Engineers, 33 West 39th St., New York City, has published a Standard on air switches and bus supports, which may be obtained for 40 cents by specifying A.I.E.E. No. 22. The text gives service conditions, definitions, rating, heating and dielectric tests. An appendix gives recommended methods for determining the r.m.s. value of a sinusoidal current wave.

STANDARDS — General principles upon which temperature limits are based in the rating of electrical machinery and apparatus are given in the A.I.E.E. Standards, No. 1. Tables and a chart, together with the temperature characteristics of the United States, help clarify the text. Copies may be obtained from the American Institute of Electrical Engineers, 33 West 39th St., New York City, for 40 cents.

COLD-CATHODE FLUORESCENT—Principle and advantages of cold-cathode fluorescent illumination for commercial, industrial and home lighting are pointed out in a 24-page bulletin published by National Transformer Corp., 232 21st Ave., Paterson, N. J. Recommended foot-candles for various types of installations, graphs and charts showing foot-candle readings at various distances from fluorescent lamp are included among technical data.



The failures of alloys of copper and zinc through dezincification has long been a problem to both producer and consumer of alloys subject to corrosive media.

The failure of condenser tubes by reason of dezincification has been the subject of widespread and intensive study over a period of many years. A digest of the published records of this study, both as conducted here and abroad, clearly points to a general conclusion that arsenic in percentages as low as 0.02% in Admiralty Condenser Tubes inhibits dezincification.

A further conclusion is that arsenic also does *not* have undesirable effects on Admiralty metal. There is no tendency towards season-cracking and stressless intergranular corrosion does not occur.

The use of arsenic as an inhibitor of dezincification antedates the use of other practical inhibitors. There has thus been a longer time for field studies and practical experiments to confirm the advantages of arsenic.

In the past three years 46 Admiralty Heat Exchanger Tubes from many sources were examined. The results are:

NO. OF TUBES	% FAILURE THROUGH DEZINCIFICATION
36 tubes without commercial amounts of arsenic	36
10 tubes with .02% to .06% arsenic	*none*

Consider the advantage of selecting Revere Arsenical Admiralty Tubes for maximum over-all economy. Replacement costs, shut-down costs, and damage costs due to tube failure may be cut considerably by specifying Revere Admiralty Condenser Tubes in your installations.

Since each condenser tube installation presents an individual problem, we invite you to use the Revere Technical Advisory Service in helping you select the best tube for maximum service and economy. This service is free for the asking.

REVERE COPPER AND BRASS INCORPORATED

Executive Offices: 230 Park Avenue, New York, N. Y.

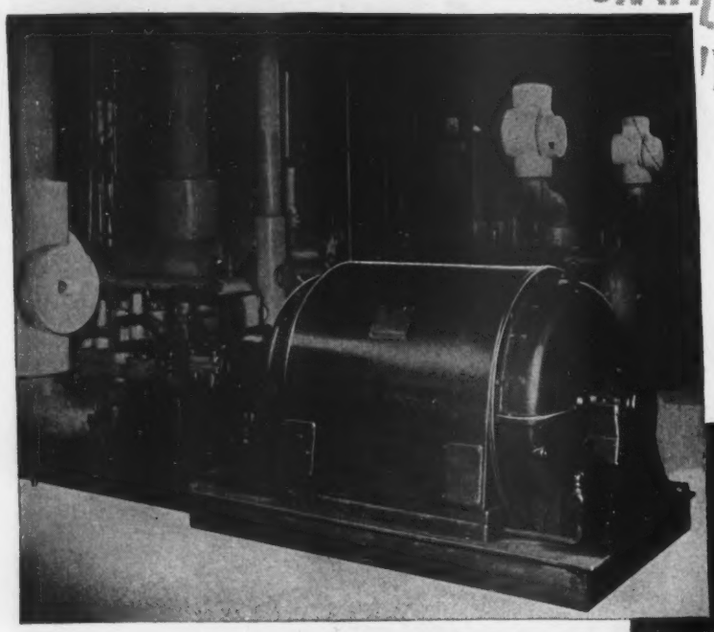
Fine plants choose

CONSOLIDATED EDISON
OF NEW YORK

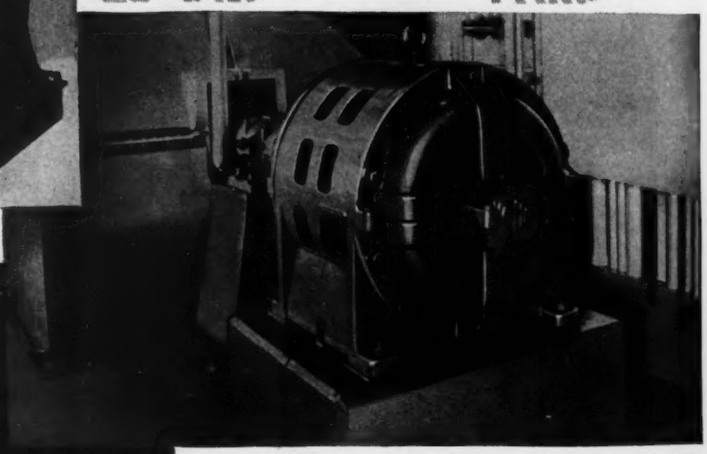
OHIO EDISON COMPANY

SOUTHERN INDIANA GAS & ELECTRIC COMPANY

OHIO POWER COMPANY



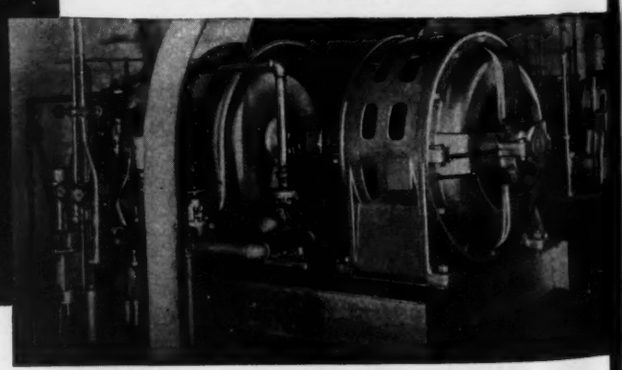
Elliott 1250-hp,. 3600-r.p.m. squirrel-cage motor driving high-pressure boiler-feed pump for topping turbine.



Above: Elliott 75-hp., 450-r.p.m. squirrel-cage induction motor direct-connected to induced-draft fan.

Below: Elliott squirrel-cage motors driving forced- and induced-draft fans. The induced-draft fan uses a 350-hp., 720-r.p.m. motor and the forced-draft fan a 200-hp., 1200-r.p.m. motor

Two Elliott 150-hp., 514-r.p.m. squirrel-cage induction motors driving condenser circulating water pumps.



ELLIOTT

ELLIOTT MOTORS

PENNSYLVANIA POWER COMPANY

CONSUMERS POWER COMPANY

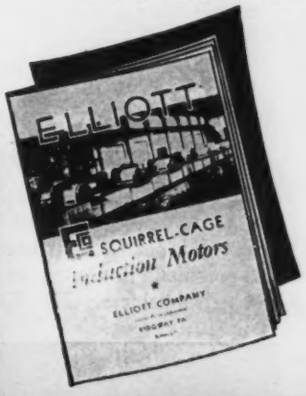
HOUSTON LIGHTING & POWER COMPANY

INDIANA & MICHIGAN ELECTRIC COMPANY

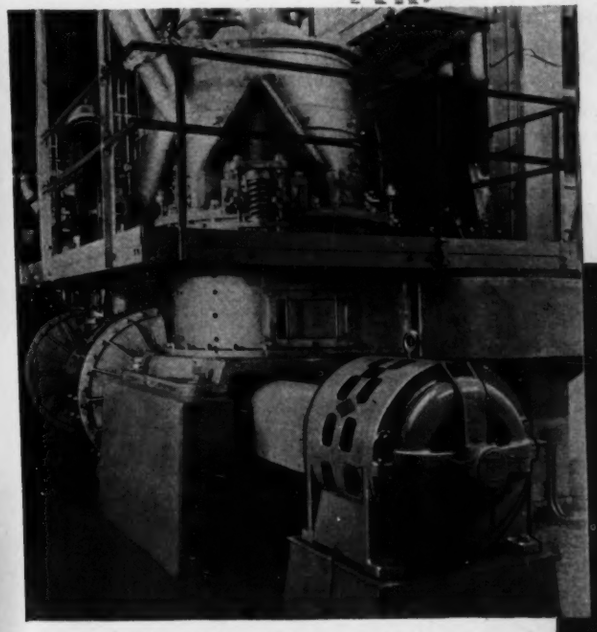
THE favor of well-known central stations is not given lightly. Auxiliary drive motors that gain that favor must earn it — as Elliott squirrel-cage motors have. How well they have earned it is shown by the standing and number of the power systems that choose them.

Taking every advantage of the inherent ruggedness of the squirrel-cage type of motor, Elliott engineers give each machine individual design as required to fit it to its specific job.

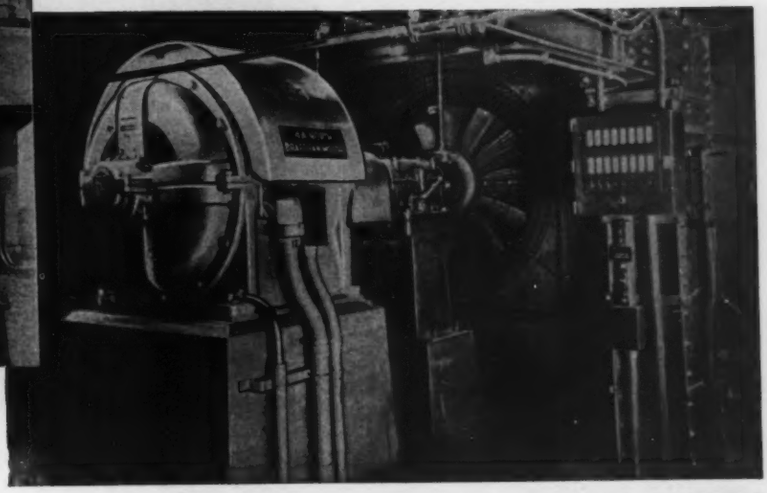
In the field of large two-pole squirrel-cage motors, the experience of Elliott Company is outstanding.



Get a copy of our Bulletin L-7 illustrated. Read about Elliott squirrel-cage motors in general. Ask us what we would suggest for your particular drive.



Two Elliott 200-hp., 1200-r.p.m. squirrel-cage induction motors driving pulverizer mills. These motors use the Elliott "diamond-cage" construction, excellent where a motor is required to deliver normal starting torque using comparably low starting current or a high starting torque with normal starting current.



Elliott 600-hp., 690-r.p.m. squirrel-cage induction motor driving both forced and induced draft fans mounted on the same shaft.

COMPANY

Electric Power Dept., RIDGWAY, PA.

District Offices in Principal Cities

L-714

PRODUCTS—TURBINE-GENERATORS • MECHANICAL DRIVE TURBINES • ENGINES • ENGINE GENERATORS • CONDENSERS MOTORS • GENERATORS • MOTOR-GENERATORS • DEAERATORS • FEED-WATER HEATERS • DEAERATING HEATERS CENTRIFUGAL BLOWERS • DESUPERHEATERS • FILTERS • VACUUM COOLING EQUIPMENT • STEAM JET EJECTORS ELECTRIC HEATERS • TUBE CLEANERS • SEPARATORS • STRAINERS • GREASE EXTRACTORS • NON-RETURN VALVES

NEWS ABOUT PEOPLE

C. H. Goddard Promoted by Pittsburgh Reflector

Charles H. Goddard, New York branch manager of the Pittsburgh Reflector Co. since 1932, has been appointed general sales manager. Mr. Goddard will continue to make his headquarters in New York City, but will spend the greater part of his time in the various sales territories throughout the United States and Canada and at the home office in Pittsburgh.

Mr. Goddard has been identified with the lighting industry for many years. Following his graduation from Ohio University he spent several years in post-graduate work and then entered the lighting bureau of Columbus Light & Power Co. He joined Pittsburgh Reflector Co. in 1931 as illuminating engineer and one year later was made New York branch manager. He has engaged in committee work for the Illuminating Engineering Society, and is chairman of the lighting fixture manufacturers' committee of the Electric and Gas Association of New York.

•

▶ J. FRANK KELLEY, formerly purchasing agent with the Tennessee Electric Power Co., has been appointed purchasing agent of the Chattanooga Electric Power Board, in charge of the purchasing division. Mr. Kelley has been a director of the National Association of Purchasing Agents and at present is director of the local Chattanooga chapter of the association.

▶ R. VOLBRECHT has been appointed to the New York merchandising sales staff of Cutler-Hammer, Inc., Milwaukee, Wis. Mr. Volbrecht joined Cutler-Hammer upon graduation from the University of Wisconsin, where he received a B.S. degree in electrical engineering. He spent a number of years at the company's main plant at Milwaukee in the engineering and merchandising sales departments and more recently was with the motor control sales division of the Philadelphia district office. With his thorough knowledge of the design, construction and application of Cutler-Hammer merchandising items, Mr. Volbrecht is well qualified for his new position in New York.

•

T. B. Ferguson Assumes New Duties in Dallas

Ted B. Ferguson, vice-president in charge of advertising of the Texas Power & Light Co., has been appointed vice-president in charge of advertising and new business. Mr. Ferguson has

been with the Texas Power & Light Co. for fourteen years, during which period he has served as salesman, district manager, advertising manager and more recently vice-president in charge of advertising.

Prior to joining the Texas Power & Light organization he had had wide experience in the insurance underwriting field, as special agent and in advertising and sales promotion work.

Mr. Ferguson was born and educated in Dallas. After spending several years in the insurance business in Dallas and Atlanta, Ga., he joined the Texas utility in 1926. In 1928 he was appointed district manager at Corsicana. He was called to the company's general offices in Dallas in 1937 to take the position of advertising manager, and in the same year was made vice-president in charge of advertising. He has been active in the Dallas Electric Club and the Dallas Advertising League.

•

▶ ROBERT H. PERRY, formerly with the Brown Instrument Co., is now sales engineer for the Ajax Electric Co., Inc., in Buffalo.

▶ W. R. MARSHALL, who recently resigned as vice-president of the Westinghouse Electric & Manufacturing Co., has announced the formation of the firm of Marshall, Sanders, Inc., investment securities, with headquarters in San Francisco. Prior to his resignation Mr. Marshall had been with the Westinghouse company for 33 years, the last ten of which he served as vice-president in charge of Pacific Coast operations.

▶ ELMER E. LEGGE has been appointed assistant director of research for the American Steel & Wire Co., Cleveland, and LEONARD F. PESKIN has been appointed technical engineer. Both men were transferred from Worcester, Mass., where Mr. Legge was district director of research for the company and Mr. Peskin was engineer in charge of transmission. Mr. Legge attended Harvard and Massachusetts Institute of Technology, taking the degree of bachelor of science at these institutions in 1918. He worked at the Watervliet Arsenal, later at McCook Field as non-ferrous metallurgist for the government and subsequently as steel specialist for the Winchester Repeating Arms Co. In 1920 he became associated with the American Steel & Wire Co. at Worcester as efficiency expert, serving successively as spring engineer, on the

ORANGEBURG HAS *long* BEEN PART OF

© Fairchild Aerial Surveys, Inc.

Have you
FACTS
on
ORANGEBURG?

What it is, what it does, how it saves time, trouble, and cable . . . all are contained in Catalog 46—a twenty-four page, fully-illustrated catalog which will be sent to any user of conduit without cost or obligation.

As in Boston, New Orleans, Kansas City, San Diego and a score of other cities from coast to coast, Orangeburg was selected for Seattle's underground years ago—and today is still good for decades of continued service.

The complete cable protection provided by Orangeburg during these years of service should interest those looking for low-cost cable maintenance. Orangeburg means no cable maintenance—means permanent protection against electrolysis and chemical corrosion.

Add to this Orangeburg's low installation cost and you have the reason why you, too, should investigate all of the advantages of this widely used conduit.

Sales Agent—Distributors

General Electric Supply Corp. — **Graybar Electric Company Inc.**

MADE AT ORANGEBURG, NEW YORK BY THE FIBRE CONDUIT COMPANY, 292 MADISON AVE., NEW YORK CITY

ORANGEBURG

NOCRETE for installation without concrete encasement
STANDARD for installation with concrete encasement

manager's staff, head of the company's physical laboratories and then as district director of research at Worcester. Mr. Peskin was educated at the Massachusetts Institute of Technology and served on the teaching staff before becoming associated with American Steel & Wire in 1934. He served first as a research laboratorian at Worcester, Mass., then as head of the vibration department of the Worcester research laboratory, research engineer, and recently as engineer in charge of transmission.

▶ DANIEL E. NOBLE, assistant professor of the department of electrical engineering at the University of Connecticut, has been granted a two-year leave of absence to head the research department of the Galvin Manufacturing Corp., Chicago. He will specialize in the development of communication equipment for emergency and military applications, chiefly in relation to national defense. He has been a member of the university staff for seventeen years and has been active in frequency modulation work.

▶ WARD H. BARNETT has been appointed merchandising manager of the Airtemp division of the Chrysler Corp. In his new assignment Mr. Barnett will promote and co-ordinate the rapidly expanding air conditioning and heating sales of the Airtemp division. He first joined the Chrysler Corp. with the purchase of Dodge Bros. in 1928. Following important sales and promotional assignments in various divisions of the corporation, he was made a sales director of the Plymouth division in 1939, where he served until transferred to his present position.

▶ J. S. JOHNSTON has retired from his position in the pole inspection department of the West Penn Power Co. at Pittsburgh, after 39 years of continuous service with the company. As foreman of construction of poles and lines, Mr. Johnston began his West Penn career in 1902 with the Pittsburgh, McKeesport & Connellsville Railways. In 1905 he moved to Greensburg as foreman of line construction, and in 1909 became district superintendent of Scottdale and Mt. Pleasant. As superintendent of light and power, territory "C," he went to Wheeling in 1915. In 1923 Mr. Johnston moved to the securities sales and financial department, and in 1932 was transferred to treasury, joining the operating department about a year later. Under his supervision in 1902 West Penn's first transmission line, Connellsville to Iron Bridge, was built, and the construction of the first high-tension tower opposite the Connellsville power station was also under his direction.

OBITUARY

▶ JAMES H. KING, general superintendent of the Eastern Oregon Light & Power Co., and a resident of Baker, Ore., for 30 years, died July 5 at his home.

▶ J. LEWIS POTTER, 72, for many years prominent in electrical contracting circles at Fall River, Mass., and a member of the firm of Potter & Earle, died in that city on August 21. He was a native of Bristol, R. I.

▶ LORENZO D. SPRAGLE, retired district manager at New Albany, Ind., for the Public Service Co. of Indiana, died at his home near that city August 13, following an illness of several months. He was 82 years of age.

▶ ROBERT H. GRAY, 64, former head of the order and information division of the Boston Edison Co., and connected with that utility for 40 years until his retirement in 1937, died at his home in Bedford, Mass., August 15.

▶ HERBERT R. WEAVER, assistant treasurer and a director of the International Hydro-Electric Corp. of New York, died in the Glens Falls Hospital August 18. Mr. Weaver was submerged in the waters of Lake George while swimming and after being revived at the scene of the accident was taken to the hospital, but died in a half-hour. He was 43 years of age.

▶ GEORGE T. BISHOP, retired Cleveland financier, and associate of Cyrus S. Eaton, died, of a heart attack, in a hotel in Chicago August 24. He was 75 years old. Mr. Bishop had suffered from heart disease for 2½ years. After developing traction holdings early in his career, Mr. Bishop in 1906, together with associates, purchased control of the Niagara, Lockport & Ontario Power Co. About this time he formed a close personal and business association with Cyrus S. Eaton, who later formed the large holding company known as Continental Shares, Inc. Mr. Bishop became president of Continental Shares in 1931, a position he held for nearly two years. In recent years he had not been active in business.

▶ LESTER P. BRECKENRIDGE, professor emeritus of mechanical engineering of the Sheffield Scientific School, Yale University, died August 22 at his home in North Ferrisburg, Vt., where he had resided since his retirement seventeen years ago. He was 82 years old. Professor Breckenridge had served as chairman of the advisory board of the Super-Power Survey, 1920-21, and was a member of the World Power Conference. A native of Meriden, Conn., and a graduate of the Sheffield Scientific School, he became identified with the teaching staff of Lehigh University, Michigan Agricultural College and later at the University of Illinois. During his tenure at Illinois an engineering experiment station was established under his direction in 1905. Professor Breckenridge did not restrict himself to academic work, but engaged in practical engineering, testing steam machinery for large corporations, conducting fuel testing work and investigating smoke prevention appliances. He went to Yale in 1909. He was vice-president of the American Society of Mechanical Engineers 1907-09, vice-president in 1905 and 1906 of the Western Society of Engineers and he was member of the Society for the Promotion of Engineering Education.

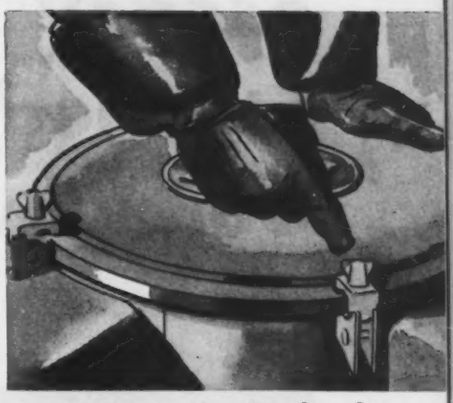
▶ WALTER B. HUEBNER, for the past seven years district manager of the Wisconsin Power & Light Co. at Clintonville, Wis., died August 20 in that city, after an illness of about a year. Mr. Huebner, who was 51 years of age, had been connected with the utility for the past 23 years.

▶ JOHN V. MILLER, vice-president, assistant treasurer and a director of Thomas A. Edison, Inc., West Orange, N. J., died August 16 at his summer home in Chautauqua, N. Y., after a two-year illness. He was 66 years of age. Mr. Miller was born in Akron, Ohio, but had resided in the Oranges for more than 40 years. Graduating from Yale in 1897, he took engineering studies at Cornell University and joined the Edison company in 1899.

▶ LESLIE R. HICKS, a consulting engineer employed by Gibbs & Hill of New York, died August 29 in New Rochelle Hospital, at the age of 59. A resident of Springfield, Mass., Mr. Hicks made his New York home at the Hotel Bristol and had been staying in that city for the past six weeks. Specializing in the laying of underground cables of high voltage, Mr. Hicks had supervised projects of that type on the Pennsylvania Railroad in Washington and Baltimore. Mr. Hicks was connected with C. H. Tenney & Co. from 1914 to 1928 and for eleven years of that period had been head of the electrical engineering department. In 1928 he resigned to join the staff of the Electric Bond & Share Co. as electrical engineer of the South American properties. After spending a year in Brazil he returned to this country and joined M. J. Daley & Co., Springfield, Mass., specializing in transmission and distribution practice. Then he became identified with the engineering staff of the Western Massachusetts Companies, with headquarters at Springfield. Mr. Hicks is a graduate of Yale University.

"Here's the Transformer Cover I've been waiting for"

1 **Every time there's** a transformer change on the lines I've got a transformer cover to deal with. The replaced transformer comes to me for a check-over and that's where I learn about covers. I've seen covers with nuts you had to burn off with a torch. I've had gaskets stick to the tank and tear when you lifted off the cover. And warps . . . mister, I've seen covers that looked like the lid on the old oaken bucket.



2 **No wonder I can** appreciate the galvanized cap wing nuts on L-M Transformer covers. There's just four of 'em to loosen, and they never freeze. You twirl 'em loose without a struggle no matter how many seasons they've been through on the line.

3 **This double-ridged** channel seat for the gasket on L-M covers gets my vote, too. A gasket *can't* tear or slip out of that groove when you take the cover off. And believe me, it's worth something to know the gasket is good as ever when you put the cover back on the tank.

4 **Another thing** that keeps L-M cover gaskets in good shape is this rolled top on L-M Transformer tanks. That rolled edge *cushions* the gasket, never cuts it. I've noticed that gaskets don't stick to the L-M tank top, either, proof enough that the paint is good and dry on L-M tanks before the cover goes on.

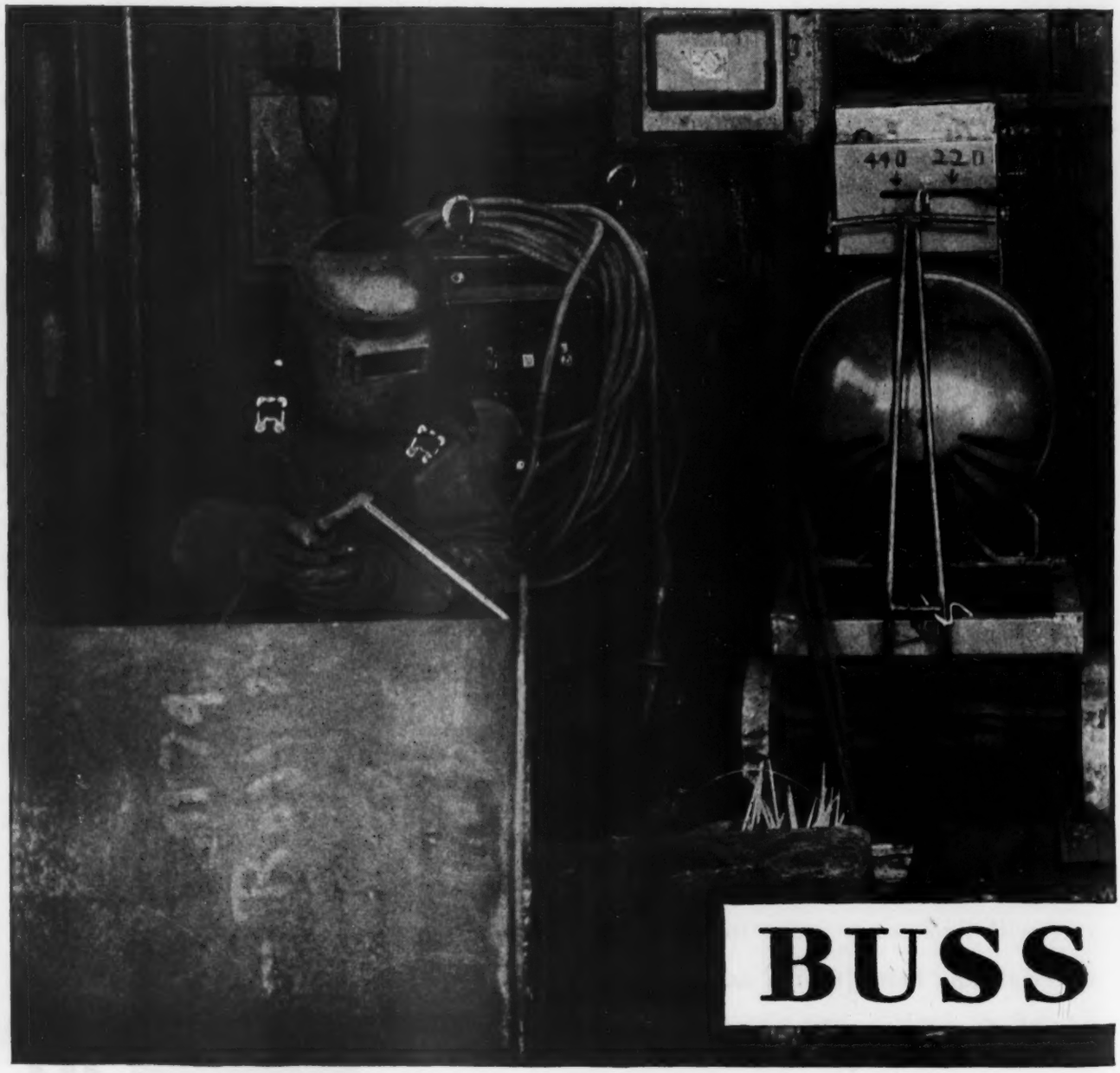
5 **What's more,** this rigid L-M Transformer cover just doesn't know how to bend or warp. That's why it always fits tight all around the tank . . . keeps the oil inside and the dirt and moisture outside.

Rigid, rugged, easy to handle . . . the L-M Transformer cover is just one of many features which explain the L-M Transformer's remarkable service records on utility lines. Throughout the L-M Transformer . . . in the core, the coil, the bushings, the tank . . . you will find many more instances where costlier materials and better design *assure* you of dependable, trouble-free service from your L-M Transformers.

LINE MATERIAL CO.

"When Our Welders Started, We Accepted Fuse Blows as a Necessary Evil . . . But BUSS Fuses Stopped the Blows and Changed Our Viewpoint"

So reports, H. K. ABBOTT,
ELECTRICIAN FOR JAMES RUSSELL BOILER WORKS, BOSTON, MASS.



"HERE WAS OUR SITUATION"...

continues Mr. Abbott, "We use a number of 20 h. p. 220 volt 3 phase portable welders for welding steel plates. They are fed from ordinary disconnect switches located around the plant. 100 ampere fuses, the largest size we felt would give us protection, blew frequently —about six times a week—when the welders were started.

We accepted these production interruptions as a necessary evil we had to tolerate to get safe protection.

In July of 1939 we replaced old fuses with BUSS Super-Lag fuses. We immediately noticed a material reduction in the number of blows. When we checked the records two months later we were astonished to find that we had replaced only six BUSS links.

BUSS fuses stopped our needless blows and changed our viewpoint on the matter of electrical protection."

Why should any plant be crippled by shutdowns that can be avoided?

Production or operating interruptions are always costly—but they are utterly wasteful when caused by the needless opening of protective devices.

Right here is where BUSS Super-Lag fuses come in to help you stop entirely or greatly reduce such wasteful shutdowns.

In the first place, the design of the BUSS Fuse-Case is such that it prevents needless blows by positively guarding against poor contact developing within the fuse itself. This eliminates much excess heating that so often blows ordinary fuses.

Secondly, the Super-Lag feature in the BUSS Fuse-Link gives BUSS fuses a time-lag long enough to hold most harmless overloads or starting currents—as witness by the experience of Mr. Abbott.

Even if you are but remotely interested in plant operation or maintenance, it will pay you to investigate—and if BUSS fuses are not being used throughout your plant—see that the men responsible for the specification and purchase of fuses are made aware of the difference between ordinary fuses and BUSS Super-Lag fuses.

If you care for detailed information, write for Bulletin Rcs. Bussmann Mfg. Co., University at Jefferson, St. Louis. *Division of McGraw Electric Company.*

Super-Lag FUSES

MANUFACTURING - MARKETS

Westinghouse Sets Aside Tax Accruals

Earnings of Westinghouse Electric & Manufacturing Co. in the second half of the year are likely to be substantially affected by reason of accruals for the proposed retroactive new taxes which were not—and could not—be taken into account for the first half of the year, A. W. Robertson, chairman, reported last week.

"It may be necessary," Mr. Robertson said, "to set aside as much as $500,000 a month in addition to the regular tax accruals of more than $1,000,000 a month for the balance of this year to take care of the proposed new taxes."

Mr. Robertson reported to directors that the total payroll for the first half of the year was $51,000,000, or at the rate of more than $100,000,000 a year. The number of employees on the payroll at present is more than 52,000, and the average monthly earnings per employee have increased in the past year from $147 to $169.

Westinghouse has been awarded a $10,865,200 negotiated contract by the Navy's Bureau of Ordnance for gun equipment. The company has received an order for high-capacity compressed air circuit breakers, totaling approximately $120,000, from Consolidated Edison Co. of New York. Thirteen breakers, two of which will have interrupting capacities of 2,500,000 kva., comprise the order. All will be rated at 15 kv. and are to be installed at the Sherman Creek generating station in New York City.

•

Opens New Houston Office

Reliance Electric & Engineering Co. is opening a sales office in Houston, Tex., with Frank A. Denison, Jr., as district manager. Mr. Denison goes to his new responsibilities in Houston from Reliance's Detroit office, where he has been a member of the sales engineering staff since early 1937. Tinkham Veale, in the sales service department of Reliance in Cleveland, succeeds Mr. Denison in Detroit.

•

Lets Six Contracts for Parker Dam

Six contracts totaling $351,110 have been awarded by Secretary of the Interior Harold L. Ickes for furnishing power equipment for the Phoenix terminal substation and the Parker power plant, Parker Dam power project, Arizona-California.

Kelman Electric & Manufacturing Co., Los Angeles, was awarded the contract for furnishing eight 161,000-volt, 1,200-amp., three-pole, single-throw, outdoor-type oil circuit breakers complete with oil, on its bid of $214,849. One of these circuit breakers is for the Phoenix terminal substation and the seven others for the Parker power plant.

Successful bidder for a contract to supply five 69,000-volt, 600-amp., three-pole, single-throw, outdoor-type oil circuit breakers was the Westinghouse Electric & Manufacturing Co., on its bid of $48,514. This company was also awarded the contract on its bid of $10,179 for six coupling capacitors and potential devices for supplying potential for synchroscopes, meters and relays.

Electric Power Equipment Corp., Philadelphia, was low bidder, at $46,606, for furnishing 58 disconnecting switches of the outdoor, triple-pole, manually-gang-operated, vertical-break or of the single-pole, hook-stock-operated type, all switches to be designed for mounting on steel structures.

Six 69,000-volt potential transformers and one 69,000 to 115,000-volt potential transformer will be supplied by the Allis-Chalmers Manufacturing Co., on its bid of $12,920. All seven transformers shall be of the oil-immersed type, suitable for operation at 60 cycles, each transformer to have a capacity of not less than 550 volt-amperes.

General Electric Co. was the successful bidder for supplying seven lightning arresters of the thyrite or autovalve, station type suitable for outdoor use on three-phase, 60-cycle circuits. Its bid was for $18,402.

Refrigerator-Range Sales Rise In July

Domestic sales of household electric refrigerators in July totaled 231,155 units, compared with 305,943 units in June and 152,726 units in July, 1939, according to an announcement made by the National Electrical Manufacturers Association. The figures were based on reports received from fourteen companies in 1940 and from seventeen companies in 1939.

For the seven months ended July 31 domestic sales totaled 1,968,703 units, compared with 1,468,516 units for the similar period of 1939.

World sales in July amounted to 243,113 units, compared with 168,196 units in July, 1939. For the seven-month period world sales amounted to 2,071,160, compared with 1,578,198 for the similar period of 1939.

Sales of electric ranges in July by nineteen companies reporting to N.E.M.A. numbered 29,626 units, compared with 19,249 units sold in July of last year by eighteen companies. Sales during the first seven months totaled 258,356, compared with 189,953 in the similar period of 1939.

•

TVA Lets Contracts for New Power Units

TVA has ordered all heavy equipment required for the power expansion program, according to Gordon R. Clapp, general manager, as contracts were awarded for the three generating units for Cherokee Dam.

The contract for the three 40,000-hp. turbines for Cherokee went to S. Morgan Smith Co. for $766,050. The three 30,000-kw. generators will be manufactured by General Electric for $1,206,565 and governors for the turbines will be made by Woodward Co., Rockford, Ill., for $70,700.

Recently Congress authorized the

Insulating Your Electrical Equipment With Fiberglas* May Make Comparable Savings

IN 1938 a certain steel company (name on request) spent $39,000 for electrical maintenance. The figures are theirs, not ours.

In 1939 they standardized on Fiberglas Electrical Insulation for motor repairs. At the year-end this maintenance cost TOTALLED $15,000.

That's twenty-four thousand dollars less.

But that's not all . . .

They kept the extra $24,000 in the bank in spite of running *more* equipment *more* hours than the preceeding year.

Their equipment worked successfully in moisture . . .

. . . in scorching heat, dust, flying scale-particles from the rolling mills . . .

. . . over pickling baths where corrosive acid fumes surround the motors . . .

. . . and on cranes where many stops and starts caused serious overloads . . .

And in all cases Fiberglas did a better insulating job. Cut down failures from overwork in the toughest spots.

*What Is Fiberglas?**

It's glass in fibrous form, made by Owens-Corning Fiberglas Corporation. It is fabricated into tapes, braids and

tying cords. It is served to magnet wire. It is combined with mica, plastics, or varnishes to make slot insulation, laminated materials and varnished cambric and tubing. In short, it is available in any form necessary for electrical insulation.

Thin but efficient, it has permitted the saving of weight and size of motors without cutting down their horsepower when desirable.

Remember, it's glass.

Moisture doesn't harm it. And it resists most chemical corrosion better than *any other* insulation in ordinary industrial use. The *only* acid that attacks it is H_2F_2.

Who Uses Fiberglas?

Smart engineers everywhere, whose responsibility is electrical maintenance!

But don't take our word for it. Here's what you do . . .

Next time you have a new installation or a repair job for a unit in really tough service—specify complete Fiberglas Electrical Insulation. When you do, you, too, may save a lot of headaches, "down time," and hard cash. For complete data on this new electrical insulation, write Owens-Corning Fiberglas, Toledo, Ohio. In Canada: Fiberglas Canada, Limited, Oshawa, Ontario.

OWENS-CORNING

FIBERGLAS*

*T. M. Reg. U.S. Pat. Off.

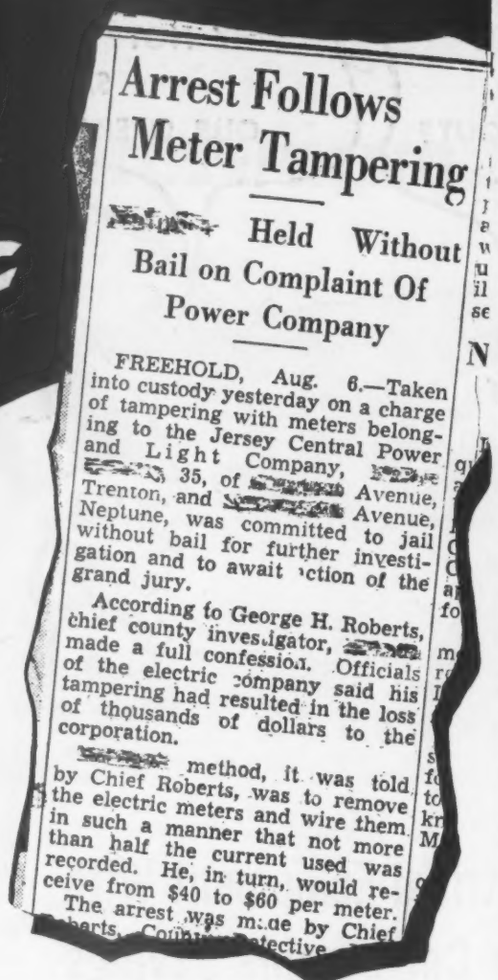
TOLEDO, OHIO

SPECIFY FIBERGLAS ELECTRICAL INSULATION

Stop that Thief

with

STAR METER SEAL



Arrest Follows Meter Tampering

[redacted] Held Without Bail on Complaint Of Power Company

FREEHOLD, Aug. 6.—Taken into custody yesterday on a charge of tampering with meters belonging to the Jersey Central Power and Light Company, [redacted] 35, of [redacted] Avenue, Trenton, and [redacted] Avenue, Neptune, was committed to jail without bail for further investigation and to await action of the grand jury.

According to George H. Roberts, chief county investigator, [redacted] made a full confession. Officials of the electric company said his tampering had resulted in the loss of thousands of dollars to the corporation.

[redacted] method, it was told by Chief Roberts, was to remove the electric meters and wire them in such a manner that not more than half the current used was recorded. He, in turn, would receive from $40 to $60 per meter. The arrest was made by Chief [redacted] Detective [redacted]

Reprint, Trenton, N. J. Times, Aug. 6, 1940

This Inexpensive Porcelain Cap Stops Current Diversion Effectively

SEND FOR SAMPLE AND PRICES

Address Meter Seal Dept.

It is now saving many utilities thousands of dollars every year. Any CS Meter can be equipped with STAR METER SEAL which must be destroyed or badly mutilated to be removed —a sure method of detecting the power thief.

★ THERMOLAIN
Rugged, Refractory Porcelain for Radiants, Ranges and Heaters

The STAR PORCELAIN COMPANY

★ LAVOLAIN INSULATING BEADS
13 Sizes

51 MUIRHEAD AVE., TRENTON, N. J.

MAKERS OF ELECTRICAL PORCELAIN SINCE 1899

$65,800,000 program which includes the Cherokee Dam, the construction of generating units at Pickwick Landing and Wilson Dam power houses and for the new Watts Bar steam plant.

•

Gas-Driven Turbine Order

Orders for two gas-driven turbines, the first to be built for sale by the company, have been received by General Electric Co. One unit will be used by a California oil refinery and the other by a Texas refinery. Details of the machines were not revealed, since the catalytic processes in which they will be involved are secret. Fundamentally, however, they will be similar to usual steam turbines except that they will operate on high-temperature by-product gases which would otherwise be wasted. The units will be rated 3,250 hp. and 400 hp.

•

Declare Bigger Dividend

Cutler-Hammer, Inc., directors declared a dividend of 50 cents a share, payable September 14 to stock of record September 3. In the previous quarter 25 cents was paid.

•

Award Diesel Contract

The Light and Power Commission of Hutchinson, Minn., has awarded a contract for a new 3,060-hp. Diesel engine to Busch-Sulzer Bros. of St. Louis for $179,775. The new Diesel will practically double the capacity of the local plant.

•

Appoints Sales Agent

Weston Electrical Instrument Corp., Newark, N. J., has announced the appointment of Howard Peterson of the Peterson Co., Denver, as sales agent for Colorado, southeastern Idaho, Montana, New Mexico, Utah and Wyoming. Mr. Peterson succeeds the late J. W. Van De Grift.

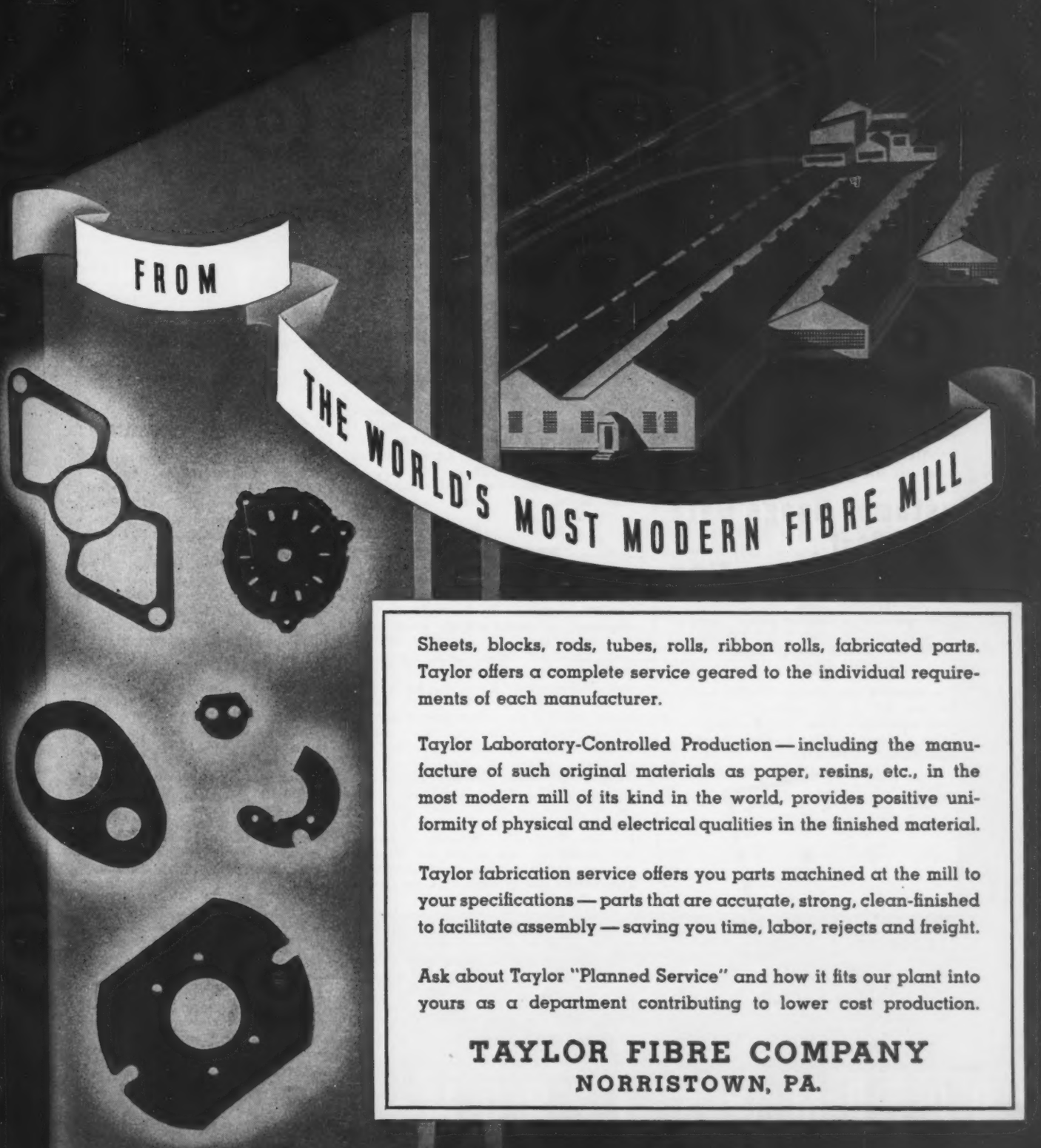
New York Metal Prices

	Sept. 3, '40 Cents per Pound	Aug. 28, '40 Cents per Pound
Copper, electrolytic	11.00*	11.00*
Lead, A. S. & R. price	4.90	4.90
Antimony	14.00	14.00
Nickel, ingot	35.00	35.00
Zinc, Spot	6.89	6.89
Tin, Straits	50.50	50.625
Aluminum, 99 per cent.	18.00	18.00

*Delivered Connecticut Valley.

TAYLOR

VULCANIZED FIBRE
PHENOL FIBRE
TAYLOR INSULATION



Sheets, blocks, rods, tubes, rolls, ribbon rolls, fabricated parts. Taylor offers a complete service geared to the individual requirements of each manufacturer.

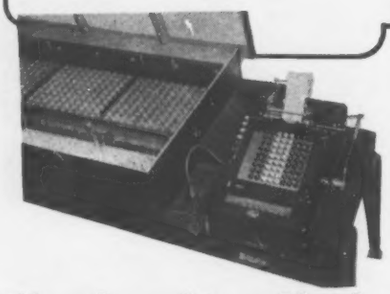
Taylor Laboratory-Controlled Production — including the manufacture of such original materials as paper, resins, etc., in the most modern mill of its kind in the world, provides positive uniformity of physical and electrical qualities in the finished material.

Taylor fabrication service offers you parts machined at the mill to your specifications — parts that are accurate, strong, clean-finished to facilitate assembly — saving you time, labor, rejects and freight.

Ask about Taylor "Planned Service" and how it fits our plant into yours as a department contributing to lower cost production.

TAYLOR FIBRE COMPANY
NORRISTOWN, PA.

Saved more than $2500. in making an accurate bill analysis



The One-Step Method of Bill Analysis . . .

The reason the R & S one-step method of bill analysis costs you less is because greatly simplified procedure enables us to provide you with accurate information in a minimum of time . . . with a minimum of expense. Wherever Customer Usage Data at lower cost . . . in less time . . . is wanted, the R & S Method of bill analysis will give it to you.

Customer Usage Data Lower Cost . . .
. . . Less Time

If your problem calls for complete Customer Usage Data at Lower Cost, done in Less Time, the R & S Method merits your serious consideration.

The standard report shows 1—The kw. hrs. per bill; 2—The number of bills; 3—Consumption in kw. hrs.; 4—Cumulative number of bills; 5—Cumulative consumption in kw. hrs.

Write for your copy of "The One-Step Method of Bill Analysis" which describes briefly how these savings are made.

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MONTREAL • TORONTO

Field Reports on Business

Electrical business during August was good, with many lines showing a continued upward trend. Heavy equipment has been in demand and government orders have tended to swell totals. A good dent in year's earnings is likely as a result of the proposed new taxes.

NEW YORK

Business concerns are closely studying the excess profits tax bill and its possible effects on earnings. Some companies are putting aside portions of their present net to provide funds to meet the increased levy.

Public criticism of the bottleneck in national defense has brought about a release of a flood of orders. Prospects are that industrial activity will be accelerated during coming months. The Navy has awarded a contract for $450,000 enlargement of the naval training station power plant at Great Lakes, Ill. Building materials will be in demand when construction of barracks to house the first contingent of National Guardsmen, and later the conscripts, gets under way. Defense housing contracts began to make themselves felt in July and will be an important factor in the large volume of residential contracts being let. The volume of factory houses being built is increasing.

Engineering News-Record reports construction awards of $57,444,000, a drop of 55 per cent from the near-record volume of August 22 week. Private construction, however, was up 7 per cent for the week.

Electrical manufacturers report good activity in many lines. Appliance sales are going well. Frigidaire reports sales and production of refrigerators and ranges for the first seven months broke all records. Vacuum Cleaner Manufacturers Association reported sales of 94,610 units for July, against 76,689 a year ago. Sales for the first seven months totaled 1,025,622, against 782,942 in 1939.

Utility construction in this area is going ahead with many new projects scheduled.

PACIFIC COAST

Electrical business has been good during August and well distributed among various branches of the industry, their classes of customers and the classifications of their stocks. Power apparatus and poleline hardware have been particularly active. Station, transmission and distribution system orders have included a $410,675 award for Ft. Peck, Mont., powerhouse; $11,078 for a Fairbanks-Morse generator system for a small municipality; $89,288 award for lighting, alarm and telephone systems at Mare Island Navy Yard, with similar systems planned for Hickam Field, H. I.; a $224,707 award for 69 miles of 230-kv. steel tower line in the Bonneville network; a $105,696 low bid for Bonneville's midway substation, and $5,000 of steel towers for Raymond station; $1,300,000 has been alotted for distribution system extensions for the San Diego fleet base.

Pacific Gas & Electric Co. is building a substation at San Mateo to handle a record increase of San Francisco Peninsula load. Municipal plans and projects include 150 dwelling units for Phoenix, Ariz., housing; a $500,000 courthouse for Vancouver, Wash.; $600,000 airports for Fresno and Stockton, Calif., and a proposed $1,000,000 bond issue for Alameda hospitals.

The large number of sizable bids covering wiring material for large general contracts now approaching the electrical stage of construction has caused exceedingly keen bidding, based largely upon original purchase prices of respective items.

CHICAGO

Normal business expansion added to the defense program spending has maintained activity in general at high levels and in some phases reached new peaks. Steadily increasing demand has left steel production in this area near capacity. Continued improvement has resulted in further expansion of manufacturing facilities in a varied list of industries.

Army and Navy orders amounting to more than $5,000,000 were placed with local manufacturers including $10,679 for lighting equipment, $29,630 for switchboards and $18,960 for meters and gauges. Housing projects costing $1,675,000 will be erected in Rock Island and East Moline, Ill., for army, navy and civilian personnel.

Electric power output declined nearly 12,000,000 kw.-hr. from the previous week to 6 per cent above a year ago. Orders for electrical equipment show considerable improvement during the past six weeks. Of 46 manufacturers reporting July sales to the Electric Association, thirty show increases over June while 34 had a gain over July, 1939.

NEW ENGLAND

Production studies now being conducted by the government in this area for the purpose of ascertaining the facilities among large industries for meeting requirements of the defense program indicate that a reasonably large portion of the new appropriations now before Congress may be allocated in New England. The present buying status is marked by important bookings of heavy marine apparatus, consisting of propulsion machinery, generators and large motors. Large-scale buying of small motors is reported for the past two weeks by one manufacturer; replacements and additions to textile mills are in good volume and should continue as the result of a fairly steady flow of government orders toward that direction, typical of which noted last week were a number that totaled $209,000.

Furnace builders are busy with rush commitments. Commercial cooking supplies are active in Massachusetts, where 135 kw. in load was recently added through one installation and 65 kw. in another. Modernization among downtown stores in Boston continues at a good pace; new sign and display lighting for one theatre totaling 11.5 kw. has been bought and 12.2 kw. in lighting effects ordered by a restaurant. Store lighting is gaining. Air conditioning is moving ahead.

A slight advance over the current trend in appliance sales is reported from several sources. In the Boston area a strong demand is running away with present stocks of refrigerators; in the Vermont area one group of central stations notes a gain of more than 10 per cent to date in orders for these units and records a steady trend in sales of ranges and water heaters.

MAKING HISTORY

. . . the ONLY motors with rotor windings centrifugally cast of COPPER!

Fairbanks-Morse Motors with centrifugally cast rotor windings of *solid copper* are making history. That's natural. Every industry that uses motors has long needed the thermal and electrical characteristics that only motors with one-piece rotor windings of solid copper can provide. Every motor manufacturer has tried for years to build such a rotor. Many made centrifugally cast windings of OTHER metals—but NOT of *copper*.

Then Fairbanks-Morse did it. It took time and money. But the result is worth the cost. Fairbanks-Morse now gives industry a better motor capable of standing up under certain conditions of *severe* service that no other motor could long endure. This motor reduces operating cost. It provides more years of trouble-free operation. It is worth investigating if you use motors. Write Fairbanks, Morse & Co., Dept. 26, 600 So. Michigan Ave., Chicago, Ill. Branches and service stations throughout the United States and Canada.

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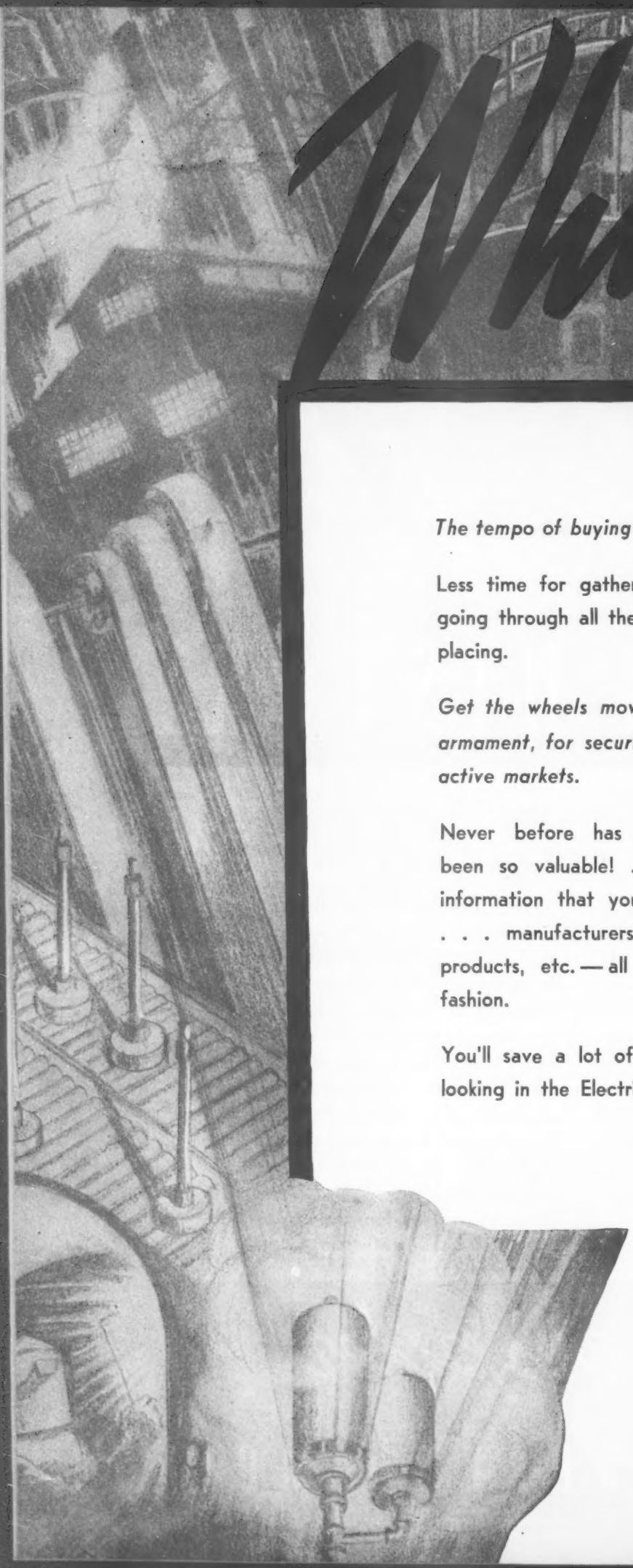
Copperspun

FAIRBANKS·MORSE MOTORS

DIESEL ENGINES · ELECTRICAL MACHINERY · RAILROAD EQUIPMENT · WASHERS-IRONERS · STOKERS
PUMPS · FAIRBANKS SCALES · WATER SYSTEMS · FARM EQUIPMENT · AIR CONDITIONERS



While the

The tempo of buying steps up.

Less time for gathering prices—writing for catalogs—going through all the steps that used to precede order placing.

Get the wheels moving—turn out more products, for armament, for security, to meet the demands of more active markets.

Never before has your Electrical Buyers Reference been so valuable! . . . Because it's packed full of information that you can use and need, almost daily . . . manufacturers' names, addresses, trade names, products, etc. — all classified in a simple get-at-able fashion.

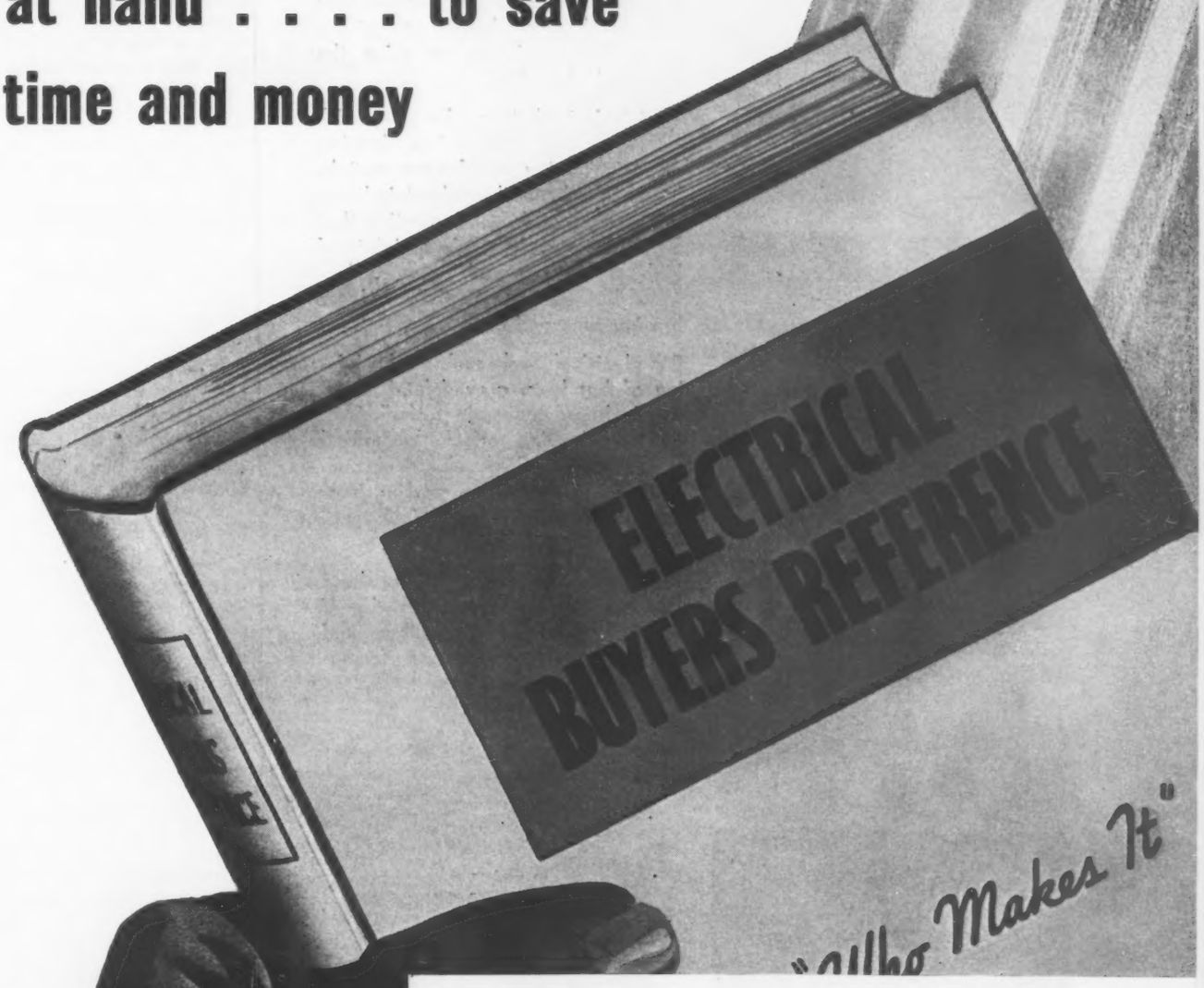
You'll save a lot of time, money and shoe leather by looking in the Electrical Buyers Reference **first!**

1941 EDITION
NOW IN PREPARATION

A staff of editors is now hard at work on the 1941 edition of the Electrical Buyers Reference. Thousands of changes in names, addresses and product data are being made. Many improvements are planned to make this new edition more valuable than ever before. An announcement of the date of issue will appear shortly.

buying tempo quickens

Keep this valuable guide near at hand . . . . to save your time and money



Over 300 pages of helpful data

1. CLASSIFIED DIRECTORY OF MANUFACTURERS:

With Company Names, Addresses and Trade Names, arranged by product. Extensive cross-references permit quick finding of the electrical and allied products made by over 3500 manufacturers. Bold-face listings throughout indicate the pages upon which the product data of manufacturers is given.

2. ALPHABETICAL INDEX OF TRADE AND COMPANY NAMES.

Complete with addresses. A buyer, starting out with only a trade name or a company name, can thus quickly locate the buying data he needs.

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Contains manufacturers' catalogs of electrical and allied products. Manufacturers usually include in these catalogs a complete listing of branch sales offices, warehouses, etc., and specifications on their products—everything needed for planning, specifying and buying.

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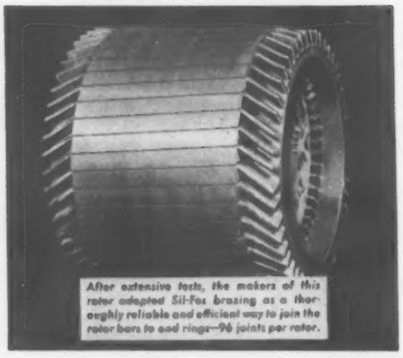
For *speed and dependability* in joining non-ferrous metals braze with SIL-FOS . . .

MANUFACTURERS have a keener interest today than ever before in materials and methods that will speed up production and at the same time maintain or raise the standard of quality.

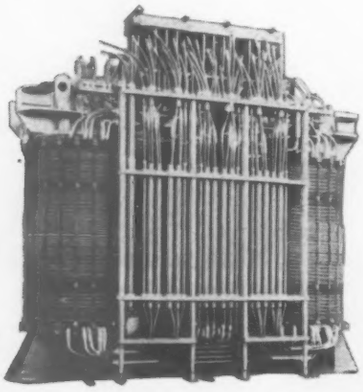
That is just what can be done with SIL-FOS low temperature brazing alloy in joining non-ferrous metals. Widespread use throughout industry has established beyond question that SIL-FOS not only produces joints of high strength, soundness and ductility, but also substantially reduces brazing time and costs.

For electrical work, such as the joining of bus bars, ground leads, lugs, terminals and connections of all kinds, SIL-FOS brazing offers the added advantages of high electrical conductivity, while the low working temperature protects the physical properties of the metals joined.

Bulletin EW-59 gives details about SIL-FOS and the reasons why it assures speed, dependability and economy in joining non-ferrous metals. Write for a copy today.



After extensive tests, the makers of this rotor adopted Sil-Fos brazing as a thoroughly reliable and efficient way to join the rotor bars to end rings—96 joints per rotor.



This 40,000 kva Transformer, made by one of the large electrical manufacturers, has more than 400 joints brazed with SIL-FOS.

HANDY & HARMAN · **82 FULTON ST., NEW YORK**

Agents in Principal Cities. In Canada: HANDY & HARMAN of Canada, Ltd., Toronto

Recent Rate Changes

PUGET SOUND POWER & LIGHT CO. has reduced its electric rates $797,450 a year, the largest single reduction in the history of the Washington Department of Public Service, according to D. G. Abel, director. The reduction, effective October 1, is the third by the company within a year, and brings the total savings to the customers to more than $1,600,000 annually. Under the recent reduction, the top step in residence, commercial and retail power rates is down to 3½ cents per kilowatt-hour, Mr. Abel states, and residence and farm customers outside of Seattle will be saved approximately $342,000 a year. An option residence and farm service rate is provided, which offers 250 kw.-hr. per month for $4.50; an additional 750 kw.-hr. at 7 mills, and all over 1,000 kw.-hr. at one cent. This means an estimated saving to customers of $17,600 annually. Seattle commercial users will be saved $181,000 annually and users outside of Seattle, $116,850.

PUBLIC SERVICE CO. OF OKLAHOMA has been ordered by the state Corporation Commission to cut its electric rates in the 129 cities served by the company. At the same time the commission announced that it had approved a new schedule reducing rates for residential and commercial consumers in Okemah, Nowata and Vinita. Reford Bond, chairman of the commission, said the commission has found that earnings of the company justify a reduction of rates in the 129 cities. The company was ordered to file reduced schedules for the other cities within a reasonable time. Chairman Bond said the reductions approved for Okemah, Nowata and Vinita will go into effect on September 1. The new rates will mean a saving of more than $11,000 annually to consumers in these three cities and reductions will range from 7 to 11 per cent, he said. The three cities will have a uniform rate. At present, the rate varies in each of the three.

NEW YORK STATE ELECTRIC & GAS CORP. has filed a new schedule of reduced rates which are estimated to save consumers in the Corning-Hornell and the Elmira districts $22,800 annually. As a result of this action by the utility, the Public Service Commission has discontinued a proceeding to investigate the electric rates charged by the company in these districts. The commission will permit the revised rates to become effective September 9. Of the total saving of $22,800 a year to consumers, $9,700 will be saved annually by general consumers in the Corning-Hornell district and $7,500 will be saved annually by power customers in that district who will be transferred to general service rates from the present power rates, and general consumers in the Elmira district will save approximately $5,600 annually.

NORTHERN STATES POWER CO. will reduce electric rates to customers about $110,000 annually, effective September 1, according to an announcement by the Wisconsin Public Service Commission. The new rate schedule will also be placed in effect by the Midland Public Service Co., also in the system of the Northern States Power Co. of Minnesota, with an annual saving of approximately $4,000 to customers.

ARGYLE, WIS., municipal electric utility has reduced its rates for 300 customers $2,100 annually.

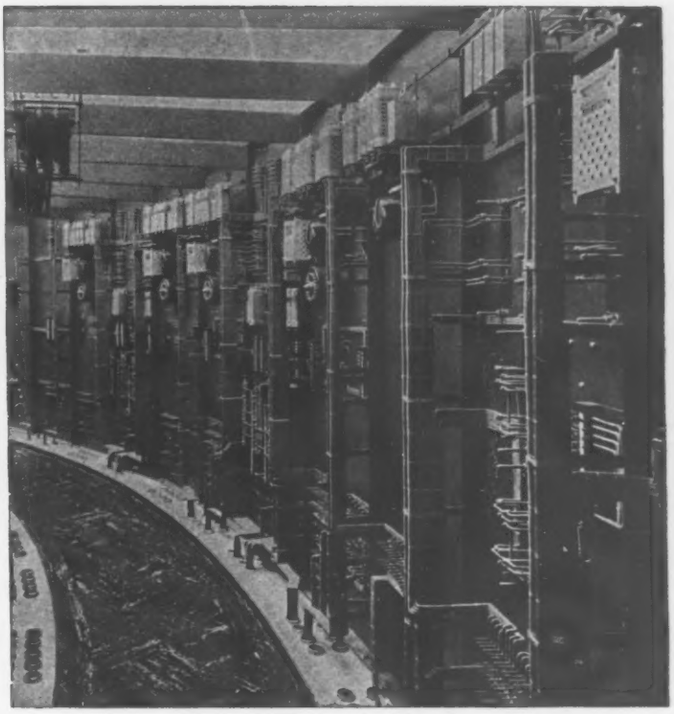
PLEASANT SPRINGS LIGHT & POWER CO., Stoughton, Wis., has reduced its rates annually $200.

CENTRAL STATES POWER & LIGHT CORP.

You're Safe!

with

ROCKBESTOS A.V.C. SWITCHBOARD WIRE . . *and these seven reasons tell you why*



Section of board in control room of a hydro station. About 40,000 ft. of Rockbestos Switchboard Wire was used on this job.

IT'S FIREPROOF. Rockbestos A. V. C. Switchboard Wire takes the fire hazard out of massed wiring because its flameproof cotton braid and felted asbestos insulating wall won't ignite, carry flame or burn. Furthermore, under exposure to flame, the insulation does not flow or fall away leaving the conductor bare.

IT BENDS WITHOUT CRACKING. Rockbestos Switchboard Wire takes sharp, neat bends without the slightest sign of braid cracking because the felted asbestos insulating wall flexes and gives over lubricated layers of varnished cambric without constricting it or imposing strain on the braid.

IT STRIPS EASILY. Rockbestos Switchboard Wire strips easily because the varnished cambric is not bonded to the conductor. One encircling cut, a pull, and it's clean, without "ringing" the conductor or leaving anything to be scraped off. Something to think about when you have a job with 10,000 ends, such as we recently supplied wire for.

THE CONDUCTOR IS CENTERED. The insulation of Rockbestos Switchboard Wire is consistently uniform in thickness and the conductor is always perfectly centered in it, and will always remain so, because the varnished cambric and felted asbestos are helically applied and will not flow or run under high temperatures.

IT'S MOISTURE RESISTANT. Rockbestos Switchboard Wire is highly moisture resistant because of the layers of varnished cambric, which also increase the dielectric strength, and the heat, flame and moisture resisting compounds with which the felted asbestos wall and cotton braid are impregnated.

IT SIMPLIFIES CIRCUIT IDENTIFICATION. Rockbestos Switchboard Wire is available in many colors and patterns to make circuit identification easy. In addition to the standard solid gray and black braids we supply red, yellow, blue, green, brown and white braids, and also numerous striped patterns to customers' specifications.

IT'S TIME TESTED. Rockbestos A. V. C. Switchboard Wire isn't new and untried. We brought it out in 1928 because too many switchboard fires were making burnt, smoking ruins of beautifully wired boards and everyone concerned was looking for a switchboard wire that wouldn't burn; one that would be *positively fireproof*. The fact that this wire proved satisfactory has been established during the past 12 years by the sale of hundreds of millions of feet to practically every switchboard manufacturer and power company in the country.

Send for samples. Rockbestos Products Corporation, 970 Nicoll St., New Haven, Conn.

Also refer to the Electrical Contracting and Electrical World Buyer's Reference Editions

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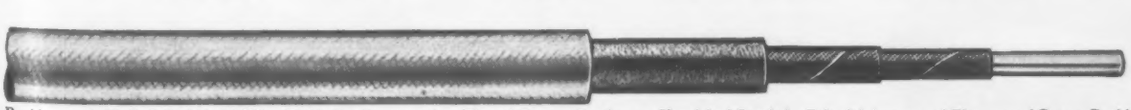

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Definite economies both in construction and maintenance are made possible by this time-tested product. Its comparatively low initial cost, its workability in the field and its consistently trouble-free performance in service are significant reasons for its selection by engineers for the more important construction jobs.

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has reduced its rates to commercial consumers in Benton, Ky., 17.2 per cent and a 8.2 per cent slash in rates charged to residential consumers has also been announced. The new rates will be effective on the September bills, with reductions being figured since August 5.

PUBLIC SERVICE CO. OF COLORADO has reduced its electric rates in Alamosa $16,500 annually. The reductions are divided: residence, $7,250; business, $7,650; secondary power, $800; street lighting, $500; municipal power, $300.

LANSING, MICH., municipal electric plant has announced a reduction in residential electric rates estimated to save consumers $125,000 a year. The new rates became effective September 1. The new schedule is as follows: 4 cents per kilowatt-hour for the first 20 kw.-hr. used per month; 3 cents per kilowatt-hour for the next 30 kw.-hr. used per month; 2 cents per kilowatt-hour for the next 150 kw.-hr. used per month; 1½ cents per kilowatt-hour for all over 200 kw.-hr. used per month. Residence off peak water heating rate is 8 mills per kilowatt-hour.

REA Allots Funds; Contracts Awarded

New allotments recently announced by Harry Slattery, Administrator of Rural Electrification, brought allotments made by REA since it was established in 1935 to $309,231,614. Among the recent allotments are the following:

FLORIDA—Tri-County Electric Co-operative, Inc., Madison, $152,000 to build and acquire 201 miles of line, 593 members in Jefferson, Taylor, and Madison counties.

MICHIGAN—O and A Electric Co-operative, Newaygo, Harry C. Wolfe, supt., $250,000 to build 179 miles of line, 530 members in Wexford, Osceola, Lake, Newago, Mecosta, Montcalm, Kent, Muskegon, Allegan, Barry and Clare counties.

NORTH CAROLINA — Roanoke Electric Membership Corp., Halifax, L. W. Anderson, manager, $343,000 to build 382 miles of line, 1,410 members in Halifax, Bertie, Northampton, Hertford, Gates, Chowan and Perquimans counties.

OHIO—Firelands Electric Co-operative, Inc., M. J. Wilhelm, supt., North Fairfield, $140,000 to build 183 miles of line, 516 members in Huron, Richland and Ashland counties.

OREGON—Northeast Clackamas County Electric Co-operative, Inc., Sandy, C. J. Sandstrom, president, $66,000 to build 60 miles of line, 174 members in Clackamas County.

PENNSYLVANIA—Southwest Central Rural Electric Co-operative Corp., Indiana, S. J. Orange, supt., $150,000 to build 167 miles of line, 365 members in Armstrong, Cambria, Indiana and Westmoreland counties.

COLORADO—Holy Cross Electric Association, Inc., Eagle, Glen Moore, president, $119,000 to build 115 miles of line, 310 members in Eagle, Garfield and Pitkin counties.

INDIANA—Morgan County Rural Electric Membership Corp., Martinsville, Robert E. Judah, supt., $375,000 to build 370 miles of line, 1,512 members in Morgan, Monroe, Brown and Owen counties.

IOWA—Butler County Rural Electric Co-operative, Allison, Thomas Epperly, supt., $110,000 to build 136 miles of line, 315 members in Floyd, Bremer, Chickasaw and Butler counties.

KENTUCKY—Pennyrile Rural Electric Co-operative Corp., Elkton, James O. Porter, supt., $81,000 to build 73 miles of line, 228 members in Logan, Todd, Christian, Trigg and Caldwell counties.

MINNESOTA—Steele-Waseca Co-operative Electric, Owatonna, L. P. Zimmerman, supt., $167,000 to build 154 miles of line, 356 members in Rice, Dodge, Steele, and Waseca Counties.

TENNESSEE—Carroll County Board of Public Utilities, Huntington, George A. Myrick, supt., $50,000 to build 55 miles of line in Carroll County.

TEXAS — Nueces Electric Co-operative, Inc., Marvin S. Baker, supt., Robstown, $134,000 to build 226 miles of line, 494 members in Nueces, Kleberg, and Jim Wells counties.

WISCONSIN—Polk-Burnett Electric Co-operative, Centuria, Dorris D. McChesney, supt., $146,000 to build 200 miles of line, 559 members in Polk, Burnett, Barron, St. Croix and Washburn counties.

Construction contracts approved between July 1 and August 21 follow:

ARKANSAS—Southwest Arkansas Electric Co-operative Corp., Texarkana, Calvin M. Hervey, Jr., supt., and P. P. Baker, Texarkana, engineer, contract to the Codell Construction Co., Inc., Winchester, Ky., for building 48 miles of line, 109 members; bid, $27,333.

GEORGIA—Slashpine Electric Membership Corp., Homerville, Edward C. Cone, supt., and Marcus Long, Alma, Ga., engineer, contract to W. A. Smith, Louisville, Ky., for building 190 miles of line, 549 members; bid, $97,651.

IDAHO—Raft River Rural Electric Co-operative, Inc., Malta, Albert H. Smith, supt., and Edward P. Eardley, Burley, Idaho, engineer, contract to the H. A. Risk Pipe & Construction Co., Nebraska City, for building 101.72 miles of line, 216 members; bid, $59,453.

IOWA—Benton County Electric Co-operative Assn., Vinton, Ivan E. Trottnow, supt., and A. W. Grubb, Vinton, Iowa, engineer, contract to the Sandberg and Johnson Construction Co., Hampton, for building 51.5 miles of line, 128 members; bid, $30,962.

KANSAS — Norton-Decatur Co-operative Electric Co., Norton, Fremont Sleffel, supt., and Raymond H. Reed & Co., Abilene, engineer, contract to Crawford Electric Co., North Platte, Neb., 103.38 miles of line, 154 members; bid, $57,809.

KENTUCKY—Meade County Rural Electrification Co-operative Corp., Bradenburg, H. Curtis Brown, supt., and Ray W. Chanaberry, Louisville, Ky., engineer, contract to the Miller-Baxter Co., Inc., Indianapolis, 101 miles of line, 263 members; bid $54,510.

MINNESOTA—Red Lake Electric Co-operative, Inc., Red Lake Falls, E. F. Kiland, supt., and Ellerbe and Co., St. Paul, engineer, contract to Sorkness Construction Co., Jamestown, N. D., 238 miles of line, 495 members; bid, $142,518.

MISSISSIPPI — Natchez Trace Electric Power Association, Houston, Bowman and Bowman, engineer, Greenwood, contract to Delta Construction Co., Clarksdale, 69 miles of line, 266 members; bid $45,368.

NEBRASKA — Cedar-Knox County Rural Public Power District, Hartington, Harold M. Martindale, supt., and H. H. Henningson, Omaha, engineer, contract to Snyder and Johnson, Inc., Humboldt, Iowa, 39.3 miles of line, 55 members; bid, $21,606.

NORTH DAKOTA—Nodak Rural Electric Co-operative, Inc., Grand Forks, Andrew L. Freeman, supt., and M. S. Hyland, North Fargo, engineer, contract to Rue Construction Co., Bismarck, N. D., 241 miles of line, 331 members; bid $137,400.

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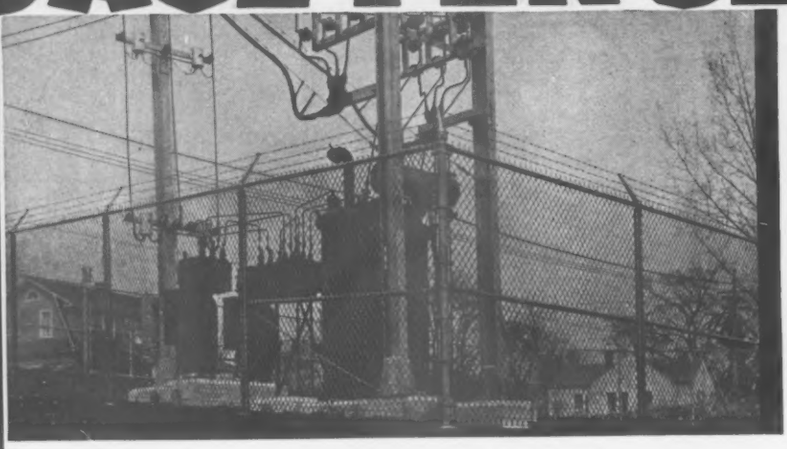

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Sales Opportunities

NEWARK, N. J.—Tube Reducing Corp., 24 Grafton Avenue, manufacturer of steel and steel alloy tubing, etc., plans installation of motors and controls, duct lines, conveyors and other equipment in new one-story addition to mill, for which work will be carried out in fall. Cost estimated close to $400,000, of which approximately $300,000 will be used for machinery and equipment.

KNOXVILLE, TENN. — Director of Purchases, Tennessee Valley Authority, Knoxville, receives bids until September 16 for oil circuit breakers, 161-kv. capacity, for installation in power substation at South Nashville, Tenn. Also, at same time, for four or more electric-operated centrifugal pumping units for Department of Chemical Engineering, two to be of vertical shaft, dry well suction-type, and remainder of horizontal closed impeller-type, in capacity range from 150 to 2500 gallons per minute under heads varying from 75 to 440 feet.

SEATTLE, WASH.—Boeing Aircraft Co., Marginal Way, plans installation of transformers, switchgear and other substation apparatus; motors and controls, regulators, duct lines, electric hoists and cranes, conveyors and other equipment in new additions to aircraft plant, comprising several large one-story structures for parts production and assembling. Entire project will cost about $7,500,000. Company also will install similar equipment in connection with expansion at plant of Stearman Aircraft Division, Wichita, Kan., manufacturer of military airplanes, where large increase in present capacity will be carried out. Cost estimated close to $2,500,000. Financing for entire project has been arranged through RFC.

TAMPA, FLA.—Constructing Quartermaster, MacDill Field, Tampa, receives bids until September 25 for power substation and facilities, transformer vaults, electric distribution lines and street-lighting system at local field (Circular 6899-39).

BEATRICE, NEB. — Southeast Nebraska Public Power District, Beatrice, plans call for bids in about 60 days for primary and secondary lines for extension in rural electric system, totaling about 50 miles. H. H. Henningson, Service Life Building, Omaha, Neb., is consulting engineer.

BELLINGHAM, WASH.—Puget Sound Pulp & Timber Co., Bellingham, plans installation of motors and controls, duct lines, switchgear, transformers and accessories, conveyors and other equipment in new addition to sulphite pulp mill, to be equipped for capacity of about 50,000 tons per annum. Completion is scheduled early in 1941. Cost of the project is estimated close to $1,500,000.

ALTURAS, CALIF.—Surprise Valley Electrification Corp., E. G. Keffer, superintendent, has plans under way for extensions in power plant used for power supply for rural electric system, including installation of new generating unit. Financing has been arranged through Federal aid.

PORTLAND, ORE.—Bonneville Power Administration, Department of Interior, 811 N. E. Oregon Street, Portland, receives bids until September 16 for six 115-kv. oil circuit breakers (Circular 1303); also, until September 12, for quantity of crossarms, braces and pole fixtures (Circular 1304).

RAVENNA, OHIO—Atlas Powder Co., Del-

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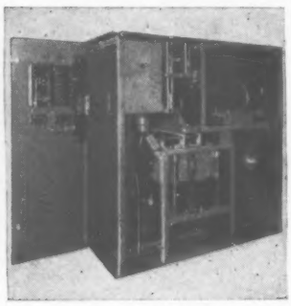

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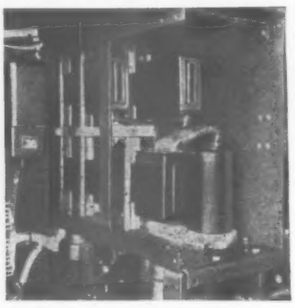

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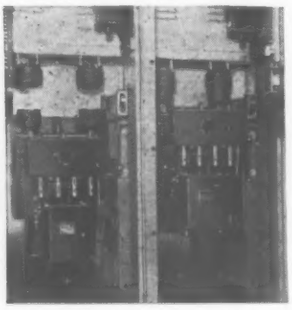

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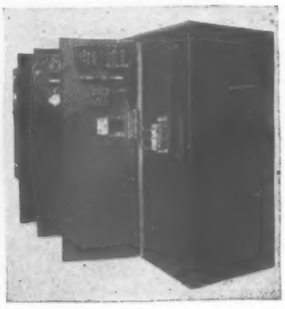

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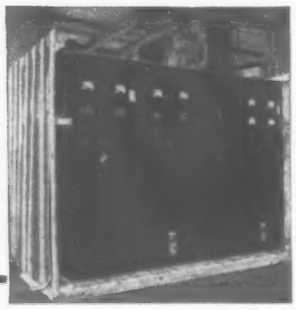

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aware Trust Building, Wilmington, Del., plans installation of transformers, switchgear and other power substation equipment; motors and controls, duct lines, regulators and other equipment in new ammunition-loading plant on 17,000-acre tract of land near Ravenna, now being purchased by Federal Government, with which contract has been made to construct and operate plant, title to property to be held by War Department. A power plant is planned, also an electric-operated pumping station. Entire project is estimated to cost about $14,000,000. Proposed to begin work at early date and complete project next spring.

CHICAGO, ILL.—Signal Corps Procurement District, 1819 West Pershing Road, Chicago, receives bids until September 26 for eight switchboards (Circular 86).

STAMFORD, CONN. — Connecticut Power Co., New London, has plans maturing for new steam-electric generating station in vicinity of Stamford, with installation of a 25,000-kw. turbine-generating unit and accessories, high pressure boilers and auxiliary equipment. Cost estimated at close to $4,000,000, including switchyard, extensions in transmission and distributing lines, and other operating facilities. Company is arranging immediate financing in amount noted for project.

EAST HARTFORD, CONN.—United Aircraft Corp., East Hartford, plans installation of motor-generator set, motors and controls, switchgear, duct lines, regulators, electric hoists, conveyors and other equipment in connection with proposed expansion at local plants, including series of one-story structures for Pratt & Whitney Division, manufacturer of airplane engines and parts, and additions to plant of Hamilton Standard Propeller Division. Entire project is reported to cost about $12,000,000 and supplements a similar extensive expansion program now in progress at plant. Company also will install like equipment in proposed new additions to its branch plant at Stratford, Conn., operated in name of Vought-Sikorsky Aircraft Division, estimated to cost about $3,000,000. Albert Kahn, Inc., New Center Building, Detroit, Mich., is architect and engineer. Work will be placed under way at early date.

MONTICELLO, ILL.—Illinois-Iowa Power Co., Monticello, has plans under way for extensions in primary lines in parts of Champaign, Tazewell and neighboring counties, totaling close to 25 miles. Proposed to carry out work early in fall.

KOOSKIA, IDAHO—Superintendent, Federal Prison Camp, Kooskia, receives bids until September 18 for one diesel engine-driven electric generating unit (Circular 22-95).

NORFOLK, ARK.—United States Engineer Office, Little Rock, Ark., will take bids early in September for primary and secondary power lines at Norfolk and vicinity, to be used in conjunction with construction of new dam at same place, for which bids also are scheduled to be asked soon.

CEDAR RAPIDS, IOWA—Iowa Electric Light & Power Co., Cedar Rapids, is arranging fund of about $2,000,000 for expansion and improvements in plants and system, including extensions in transmission and distributing lines, power substations and other operating structures. Also for expansion in rural electric system.

CHICOPEE FALLS, MASS. — Constructing Quartermaster, Westover Field, Northeast Air Base, Chicopee Falls, receives bids until September 24 for electrical distribution and street-lighting system at local field.

While there is time—

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And we can do it — not only in planes but in tanks and guns and clothes and boots and all the thousand and one items that go to make up military procurement today.

[But we can not wait for new plants!]

And so, while there is time, let's immediately look into efficient multiple-shift operation for every present plant whether it is to handle National defense orders or is to take up the surge of other business. A prime requirement will be that night and day seeing conditions are equalized. Modern lighting developments hooked up with fresh painting make this a comparatively simple job — but this should be done now while equipment, time and labor can be allocated to it.

While there is time, let's see what can be done to simplify operations to avoid bottlenecks due to shortage of trained labor.

While there is time, let's look into flexible power distribution to permit quick layout changes without unnecessary interruptions.

While there is time, let's install protective lighting for plant exteriors, grounds and yards.

While there is time, (fantastic as the need may appear) let's think about operation under blackouts. This means not only adequate lighting but also ventilating and air conditioning for production under sealed-in conditions — A good investment in any case.

AND FINALLY, inform your power company of any contemplated additions to your requirements. Abundant power is available but in your own interests give the power company an opportunity to get the additional "copper" in time to arrange for adequate service on any increased needs.

"While there is time" is an editorial

from TIMELY IDEAS

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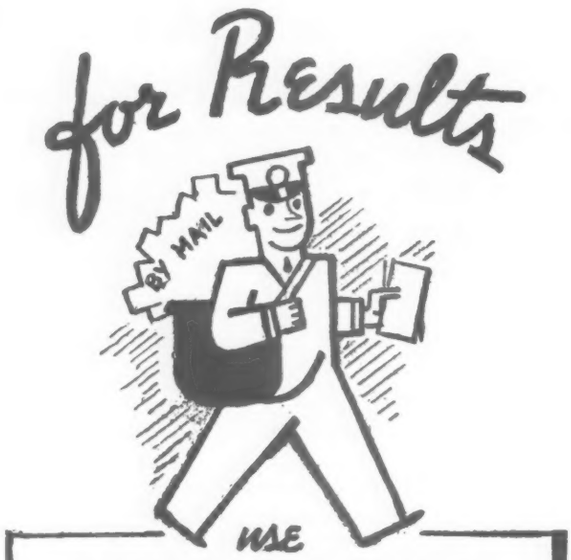

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Practical Distribution Economies

[*Continued from page 54*]

out differently from the system as a whole. One of the leading manufacturers co-operated with us recently in making a surge test on secondary gap arresters for meter protection. The net result of that was that the meter received protection if the arrester was not located any further from a socket type meter than the weather head.

3. Tree trimming by the company's own line clearing crews versus contracting it out has many practical features. In the first place it is slightly cheaper to trim with company crews if they are properly trained and equipped. Then the tree crews can be used as feeders for line crews. Probably the most valuable asset of a company tree crew is the contact that the foreman has with the property owner and the confidence and trust he is able to build up by repeated trimming over a period of years.

4. Replacing blown fuses on a "lights out" complaint is a fertile field for practical economics, whether you charge for these calls or not. By using "Fusetrons" instead of conventional type plug fuses a 30 per cent reduction in the number of such calls can be made.

Pole Unloading Made Safe

5. Unloading a car of poles has always been more or less of a hazard. Our safety department has recently designed and perfected a safe and inexpensive way for one or two men to do this difficult job (see ELECTRICAL WORLD, December 16, 1939, page 64).

6. Do your trucks carry too much or too little? It has always been difficult to have just enough tools and material with you to do the job when away from headquarters and not lose time and waste transportation going back to get what you forgot. In standardizing the truck body design it is first necessary to standardize as much as possible the tools and equipment to be normally carried. Since space is at a premium, the boxes should conform to the size of the equipment therein. By securing a list of the service men and the crews that were always prepared for a case of trouble and had a good reputation for efficiency, and then making a surprise inspection, an average list of

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The Greenlee Hydraulic Bus-Bar Bender, now ready for the power utilities and electrical contractors, has been developed to bend, easily and quickly, bus bars up to 4" wide and ¾" thick. With this bender it is now also possible to make accurate U-bends of any size, ranging upward from the small "U" with a 3½" inside width. The bus bar bending attachment has been made to fit the power unit of the regular Greenlee No. 770 and No. 770-T Conduit Benders, and can be purchased as a separate attachment for this Power Unit or as a complete Bus-Bar Bender with power unit and attachment together. Why not find out how this new tool can save you money on new installations and repair jobs?

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GREENLEE TOOL CO., 1705 Columbia Ave., ROCKFORD, ILL.

equipment was secured that included the essentials but omitted the superfluous gadgets.

7. Speaking of trucks—have you found it necessary to indulge in expensive two- or three-ton trucks in order to carry all the boxes, gadgets, etc., that we formerly thought necessary?

8. Tool economy is hard to secure and to keep when once secured. By having an experienced engineer study each tool in the light of its necessary function astounding reductions have been made in annual purchases of this kind. Flashlight purchases are only one-third what they were three years ago. This was accomplished by buying better lights, particularly suited for our use.

9. A survey revealed that a large number of line fuse links failed before being placed in service. By equipping all trucks with a light, handy fuse box containing the necessary assortment of links, the number of links purchased has been reduced 50 per cent in three years.

Savings on Small Items

10. Rubber glove purchases were cut 33 per cent in three years. Ladders were standardized and stocked in our warehouses instead of purchasing whatever the local hardware dealer happened to have. A standard two-piece switch-stick was designed, capable of answering all the normal requirements of both transmission and distribution.

11. Perhaps the most common discrepancy noted in a business district is a rack or house bracket pulling out of a brick wall. This has been given engineering attention and corrected by use of the proper brick drill and lead anchor.

12. When distribution expenses get out of hand it is sometimes hard to put your finger on the spot where the trouble is. In what particular phase of the work are we spending too much money? Since this will probably be reflected in the particular sub-account used to meter the various classes of distribution expense, a graphic record of the trend of each sub-account is very helpful. Trend curves based on a year's expense adjusted monthly will soon indicate just where increases or decreases in expenses are occurring. Curves for total distribution expense of a company will establish trends and similar

curves for divisions or districts will bring out the particular divisions or districts responsible for any sharp changes in trends, thus pointing out where investigations should be made. The trend curves will also point out defects or lack of regularity in accounting methods which permit charges to pile up at the end of the year.

Quality Electric Alloy Steels

[*Continued from page 60*]

coming more and more important with the use of modern high melting voltage. They are compact and a new feature of rubber ball flexibility is used.

Mill Power

One of the four 24-kv. circuits from the 132-kv. substation runs over the roofs of the melt shop and blooming mill to a point adjacent to the switchboard and motor room. This mill-supply substation has three G.E. 2,000-kva. transformers, from which underground conduit lines serve the power requirements of the plant at 2,300 volts.

The 29-in. blooming mill (three-high) is driven by a 1,200-hp., 360-r.p.m. Westinghouse slip-ring induction motor with liquid rheostat slip regulator, two flywheels and Falk speed reducer. The 24-in. bar mill is driven by a 1,200-hp. motor of 505 r.p.m.; it, too, has two flywheels, a Falk speed reducer and a liquid rheostat slip regulator.

Reactors are installed on each 2.3-kv. line out of the mill substation to limit short-circuit duty on the 15-kv., 1,200-amp. G.E. oil circuit breakers which protect the mill power supply. These will be rated 66 kva., 1,440 amp. and 45.7 volts at rated current for the mill supply transformers. Westinghouse boric acid fuses will be installed on major mill equipment as local fault protection.

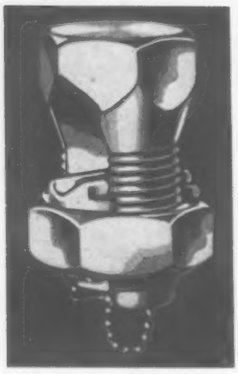
•

Form Illinois Tech

Armour Institute of Technology and Lewis Institute have consolidated, resulting in the formation of the Illinois Institute of Technology. It was stated that the merger will result in a more effective service to industry and the engineering and architectural professions.

MACHINING like this
Makes CONTACTS like this
L-M Split Bolt Connector
L-M Nut Retainer Connector
L-M Drop-On Connector
Twirl the nut on *any* L-M Connector and note how smoothly it glides up the thread. Right there you have the evidence of *perfect machining*, and the big reason why L-M Connectors give you such high pressure between conductors at remarkably low torque. Machining like this, plus the high strength, corrosion-resisting, copper alloy that goes into them, enables L-M Connectors to withstand far higher ultimate torque than service conditions demand. *Save* . . . re-use your L-M Connectors over and over again. Their high conductivity assures low resistance connections, the day they come out of the carton . . . and twenty years later.
LINE MATERIAL CO.
MILWAUKEE, WISCONSIN

The MOST COMPLETE
LINE OF
Service Connectors



LARGEST VARIETY of types, and a COMPLETE range of sizes. For all kinds of conductors.

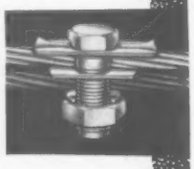
Popular connector at left is carried in stock in ALL sizes, up to 1,000,000 CM. Furnished with or without retainer.

ANY MATERIAL — Hardware Bronze, Silicon Bronze, Aluminum.

MILLIONS IN USE and never one rejection due to performance or workmanship. Can be re-used over and over.

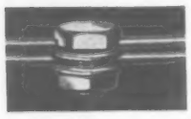
MADE IN OUR OWN PLANT under engineering supervision. Bodies and nuts precision machine-threaded for perfect fit. No sharp edges.

ALUMINUM Connectors machined from hard drawn rod, with forged spacers.



SERVICE POST Connectors for one or more conductors; many types.

SERVICE ENTRANCE Connectors with extruded copper bodies, Everdur screws.



TELEPHONE Service Connectors, brass rod—plain, nickel plated or tinned.

AND THOUSANDS MORE. Every connector Dependable. Preferred by leading utilities and "industrials," and manufacturers of electrical equipment.
Write for Catalog.

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

Roasters Selected as Load-Building "Natural"

[*Continued from page 55*]

this tendency, we soon found it was just as easy to feature and sell the complete roaster with broiler and griddle for only $4.95 more. As a result of our merchandising effort, the percentage sold complete was greatly increased.

During the second year we made every effort to increase and encourage dealer sales. Every advertisement and piece of literature carried the phrase, "At your Edison office or at your electrical dealer."

All selling helps at our disposal were disseminated through distributors to the dealers, but our company was frankly disappointed with dealer volume of roaster sales. A great many dealers were interviewed concerning roaster sales, and a majority claimed that their greatest obstacle was their inability to finance them properly. Their financing channels were reluctant to accept contracts with such small balances, as the collecting and billing expense made it unprofitable.

New Time Plan

This problem was met by our plan inaugurated last March, when, through the co-operation of the roaster distributors, we persuaded a large banking and financing firm with branches throughout Edison territory to accept roaster paper for $3 down with twelve equal monthly payments. The total finance and collection charge was only 25 cents, and the paper was guaranteed by the Edison company, with no recourse to the dealer if the paper reverted.

To publicize the plan we placed five large advertisements in each of the newspapers throughout our territory and backed them with 230 large billboards featuring "$3 down at all electrical dealers."

To put a hook on the newspaper advertisements a coupon was attached entitling the holder to a set of lifting tongs if he presented the coupon to a dealer's store and asked to see the roaster.

A joint meeting of roaster distributors and manufacturers' representatives was held in our auditorium to synchronize all efforts, and a copy of "Dealer News" was sent to all potential roaster outlets announcing the plan. After our men had worked with a few dealers, it became evident

EVERSTICK ANCHORS...

Provide dependable anchoring when poles are subjected to unusual strains from storms. Made of tough, certified, rust resistant, malleable iron for extra strength and holding power. Write for new bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

ACME BIAS TAPES

are made of high grade cotton fabric treated with special varnishes from Acme's own varnish plant. They have great tensile strength and flexibility and may be stretched snugly into all corners and crevices, making a mechanically smooth and electrically efficient seal. Offered in bias or straight tapes or rolls up to 36" wide, yellow or black. Samples if requested. Address *The Acme Wire Co., New Haven, Conn.*

Acme Wire Products
VARNISHED INSULATIONS — MAGNET WIRE
COILS — CAPACITORS

that the greatest need was an organized presentation and demonstration for dealer floors. This was carefully compiled. After tests and many alterations this was made available to all dealers and department stores.

Demonstration Detail

Practical tests soon brought out the fact that when at least three roasters were used for demonstration and sales presentation procedure, the sales curve was most satisfactory. In explanation of this statement let us point out that if the salesperson attempted to show how easily the oven lining is removed, the lid, racks, utensils and broiler must be taken out and frequently were strewn around on the tops of radios, ranges, etc., creating the impression that the roaster was "messy" and inconvenient. Hence the plan of having one roaster without lid and without pans, located in a position that invited inspection of the oven walls, removable lining, etc., and one with the broiler set up and ready to use, while the third one was displayed, ready to wrap up, complete with choice of utensils. This permitted the salesperson to progress from one sales point to the other without confusion, delay or embarrassment.

The automatic time switch, offered as optional equipment, was found to draw attention to "more abundant" electrical living and added automatic time control to the electric roaster.

At the time this is written it is impossible to estimate all the results this program is producing, as our dealer reports of last year carried no accounting of roaster sales. No accurate comparison can be made, but the number of dealers displaying and carrying roasters has been greatly increased.

This alone has encouraged us to place again dealer roaster ads featuring all five NEMA roasters, and many department stores and electric dealers have responded with favorable comment, expressing their appreciation of our efforts.

•

Utilities Gain in Value

Valuations of private electric utilities operating in Oregon increased to $103,693,298 in 1940 from $102,394,856 in 1939, according to the state Tax Commission. Valuations of all private utilities increased from $28,374,901 to $286,295,996.

Now YOU CAN MODERNIZE YOUR Meter Testing Equipment

The States Company combination Stroboscopic and Timed Revolution Control Testing Outfit is designed for adaptation to your present test table.

● What your customer regards as an electric meter is actually your cash register. It must be kept as accurate as advanced testing technique can make it. Many electric utilities have tested watthour meters by some stroboscopic method for years with resultant savings in man-hours and protection of income dollars through improved meter accuracy. Now greater savings and higher levels of accuracy are possible with the States Stroboscopic Testing Outfit. Companies making trial tests with "Strobo" equipment show a rise in output of meters tested of from 2 to 4 times the former production, a reduction in observational and personal errors to almost zero, and a uniformity of results from all testers in all companies.

ABOVE is a photograph of an "as found" test, using the new States "Strobo" testing outfit on a present test table. The light transmission rod is directed at the milled edge of the meter disc, the Registration Indicator dial is turned until the stroboscopic effect makes the marks on the meter disc seem to stand still, a direct reading is then made from the Indicator dial setting. The entire operation takes but a few revolutions of the disc. The result is absolute. The "as found" test can now be made either stroboscopically or with timed control with the *cover in place.*

"As found", full load, light load, and 50% power factor tests are made either by the "Strobo" or Timed Revolution Control method. Thus all single phase meters can be tested by either one or the other of these methods.

Advantages of Stroboscopic Plus Timed Revolution Control Method

1. Any single phase meter having a basic constant of ⅓, .3 and .6 may be tested by these units.
2. No duplicate equipment is required as this outfit is adaptable to practically any test table now in service.
3. The current and voltage sources now on the table are used in conjunction with the "Strobo" Unit. The loading equipment on the table still remains in use.
4. No elaborate adjustments are necessary to prepare meters of different makes for test.
5. All "strobo" tests are made while the meter is in rotation, thus immediate, rapid, and accurate adjustment changes may be made without repeat runs.
6. Under the "strobo" light, the tester can detect such things as dirty bearings, faulty jewels, damaged register gear trains, etc. —sources of trouble indicated by a varying velocity of the disc, detected by the "strobo" light.

For a complete report request Bulletin 309 or

Send This Coupon to . . .

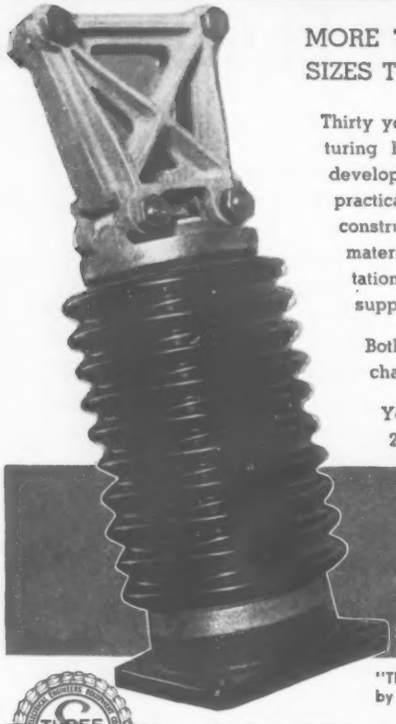
THE STATES CO., Hartford, Conn.
Bulletin 309, please

Name .....

Title .....

Address .....

At Your Service!



MORE THAN 2000 STOCK DESIGNS AND SIZES TO MEET EVERY OPERATING NEED

Thirty years of experience in designing and manufacturing high grade bus supports have resulted in development of a complete line capable of fitting practically any installation. Good designs; careful construction, and the use of only the finest materials are responsible for the enviable reputation and performance records of "Three E" supports.

Both indoor and outdoor styles feature interchangeability of parts.

Your copies of Bulletins 125, 126, 200 271, will be sent promptly upon request.

Three E standard supports are listed for all commercial sizes and ratings for indoor and outdoor service. Top fittings are available for bar, tubing and cable with vertical or horizontal adjustment features if desired. Many different mounting styles are also available.

"Three E" Products are manufactured in Canada by N. Slater & Co., Ltd., Hamilton, Ontario

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Electrical Engineers Equipment Co.

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"IMPROVED METAL SNATCH"
Another
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In Favor With Linesmen

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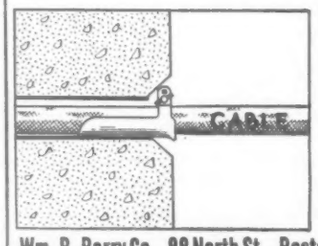

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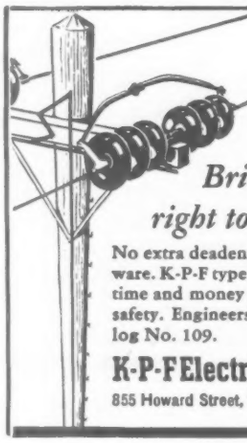
Cartridge Fuse Tongs
Switch Hooks

Send for Catalogue

We have been making safety tools for 24 years

THE G. C. A. Manufacturing Co.
Pittsfield, Mass.



Bring the line right to the switch

No extra deadends, no extra hardware. K-P-F type "S" switches save time and money . . . provide extra safety. Engineers! Write for Catalog No. 109.

K-P-F Electric Company
855 Howard Street, San Francisco, Calif.

LETTERS TO THE EDITOR

Need Yesterday's Record to Prevent Mistakes Today

To the Editor of ELECTRICAL WORLD:

The letter of Mr. James in your issue of August 10, 1940, including reference to your former editorial and its quotation in *Electrical Engineering*, is very much in harmony with views expressed by the writer in a paper presented to the American Association for the Advancement of Science at Ottawa, June, 1938. The two concluding paragraphs of the latter present the need for historical references from a somewhat different perspective, and with the hope that some one may be encouraged to undertake such work as his experience and time may warrant I would like to repeat the comments there made:

"The field of electrical engineering as a special branch is comparatively new. As a consequence, a newcomer studies the subject from modern texts and probably, with some justification, feels quite well posted. A tendency, however, is becoming apparent to revive practices purporting to be new, but which have been tried out and abandoned for various reasons in former years.

"Having such observations in mind, I would like to suggest in conclusion that the electrical engineer may and probably would find practical use for historical reviews of the special branches in which he is interested. It would appear that as time advances the need for reference to the historical phases would become more and more urgent if continuous progress is to be made, and a cyclic order of failures and successes avoided. Such summaries could also be given a fair share of romance; in fact, the romantic features of developments in electrical engineering appear to be unlimited."

W. B. BUCHANAN,
Testing Engineer
Hydro-Electric Power Commission of Ontario.

•

Neon Lamps Available Without Ballast

To the Editor of ELECTRICAL WORLD:

In the June 15, 1940, edition of ELECTRICAL WORLD there appears on page 80 a description of an electronic circuit for spotting stray impulses.

One of the essential components of

DIECK MIDGET TAPS
FOR ALL COPPER OR
ALUMINUM CONNECTIONS

WRITE FOR BULLETIN NO. 7140 CONTAINING FULL INFORMATION ON MIDGET TAPS AND OTHER DIECK TAP CLAMPS SAMPLES SENT ON REQUEST — NO CHARGE

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Electrical Specialties
High and Low Voltages

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PORCELAIN WORKS
TRENTON, NEW JERSEY

TRICO FUSE PULLERS
PLAY SAFE!

DON'T
PULL
FUSES BY HAND

TRICO FUSE PULLERS are cheap insurance against shocks, burns, infections, lost time and unnecessary compensation costs.
ORDER SOME TODAY!

TRICO FUSE MFG. CO. Milwaukee, Wisconsin

this circuit is a neon glow tube and, as indicated in the text, it is necessary to remove the ballast resistance from this tube for the most successful operation.

It may be of interest to some of your readers to know that these neon glow lamps are available without the usual ballast in the base and equipped with either bayonet type or prong type bases. Obtaining the lamps in this form eliminates the hazards of heating and removing the base in order to take out the resistor.

H. M. Ferree,
Lamp Department,
General Electric Co.,
Nela Park, Cleveland, Ohio

•

The Young Engineer and "Personalities"

To the Editor of Electrical World:

In the August 10 issue of Electrical World appeared an article of general interest entitled "Engineering Personalities" (page 45). Being a young engineer, it is quite natural that I have an opinion of my own.

I do agree with the author in as much as minds as keen as those of the past generation are probably being applied to current problems, and further, I contend that even more astonishing accomplishments are being made. The sharp contrast between conditions then and now is that progress is no longer the consequence of the application of one great mind, but rather the product of closely co-ordinated, highly co-operated mental exertion by many.

With this as a basis, how can any one man be given the credit for a major development? The credit is given to the financial sponsor of the enterprise; those responsible for the success of the project are probably struggling to produce the solution to another greater and more complex problem before the merits of their work is recognized. One, or several, men may be permanently assigned to investigate further and promote commercial applications and for a short time receive publicity until a more sensational advancement is made, and advancements are made so rapidly that no one man can possibly cover the entire field.

From observation, I have also concluded that when the honor of achievement is bestowed upon one man a grave injustice is often done.

There is another phase of the problem which is not generally recognized: Are as many keen minds being applied to engineering problems today as previously? Are as many capable individuals selecting electrical engineering

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Our new machine cut continuous slab gain is a special development on cedar that insures perfect drainage and therefore becomes an important factor in longer pole life. In addition, this modern process in pole production means uniform, smooth facing. This permits the cross arms to be bolted to the poles securely, contributing to maintenance savings. This work is done to your specifications. Improved pole appearance is one of the numerous benefits of slab gaining.

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Slab gained — for perfect drainage — for secure arming — for much better appearance.
Full length treated — for sterilization of sapwood — for uniform light brown permanent color — for attractive appearance.
Machine shaved — for increasing life of the pole above the ground — for improved appearance.
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READERS MAY CONTACT

the consultants whose cards appear on this page with the confidence justified by the offering of these special services nationally.

as a career now as previously? The logic behind the skepticism is that engineering minds are always speculating upon the future, recognizing the facts. Also, they are human and strongly desire a high standard of living as soon as possible. If such an individual sees a more prosperous future in another field, the profession may be deprived of a potential genius.

In closing, allow me to express another opinion. The period of "One Man Glory" is past (or passing, if you prefer), and the problem is not to restore that condition, but devise something new—be progressive! As a suggestion, something might be done to improve the financial condition of those who have established themselves in the field; produce evidence that there is an optimistic future for a successful electrical engineer and the tempo of advancement will show a further increase. Never cite an example of the past as an ideal; all engineers, especially electrical, live in the future.

LAUREN L. JOHNSON,
Milwaukee, Wis.

•

Statistical Control of Product Quality

To the Editor of ELECTRICAL WORLD:

I have read with considerable interest the editorial titled "Statistical Control of Product Quality," in the July 27 issue of ELECTRICAL WORLD. I am very much interested in this subject and am wondering if you could supply me with some more definite information concerning the movement referred to in the editorial, and whether or not there is any actual published information available along the lines discussed therein.

E. H. ERICKSON,
Research and Engineering Dept.
RCA Manufacturing Co., Inc.
Harrison, N. J.

[This topic was discussed at a round-table conference at the A.I.E.E. summer convention at Swampscott in June (see page 338 of the August *Electrical Engineering*). One of the speakers was Walter A. Shewhart of Bell Telephone Laboratories, who has recently published a monograph entitled "Statistical Method from the Viewpoint of Quality Control." His earlier (1931) book, "Economic Quality Control of Manufactured Product," deals with the basic theory. There was also a ten-page article, "How Statistics Help the Engineer Control Quality of Product," by John Gaillard, in the May, 1940, issue of *Industrial Standardization*, published by the American Standards Association. —EDITORS.]

Treated Poles Show 31% Gain in Year

The number of poles treated last year shows an increase of 31 per cent over those in 1938, according to statistics compiled by R. K. Helphenstine, Jr., of the U. S. Forest Service, in co-operation with the American Wood Preservers' Association. In 1939 there were 4,634,793 poles treated, the largest number ever reported in a single year. This compares with 3,545,077 in 1938.

More than 78 per cent of the poles reported were given a full-length pressure treatment. Southern pine ranked first with 3,562,295, the largest number ever treated in any one year, and comprising 77 per cent of all poles treated. The increase in southern pine poles amounted to 42 per cent over those treated in 1938.

Poles Treated by Kinds of Wood and Kinds of Treatment—1939

Kind of Wood	Pressure Treatment (Number)	Non-Pressure Treatment (Number)
Southern pine	3,561,123	1,172
Cedar		
Western red	7,400	816,398
Northern white	.....	141,156
Oak	.....	33,805
Lodgepole pine	25,427	4,053
Douglas fir	14,168	.....
Chestnut	.....	5,561
Red (Norway) pine	2,231	.....
Miscellaneous	22,299	.....
Total	3,632,648	1,002,145

Western red cedar ranked second with 823,798 poles, of which all but 7,400 were butt-treated, an increase of about 12 per cent. Northern white cedar ranked third with 141,156 poles treated, which is approximately 10 per cent more than treated in 1938. The balance of 107,344 comprised poles of lodgepole pine, Douglas fir, Norway pine, oak, chestnut and a few miscellaneous species.

More than 99 per cent of the poles were treated with creosote.

The accompanying table shows the species and the method of treatment.

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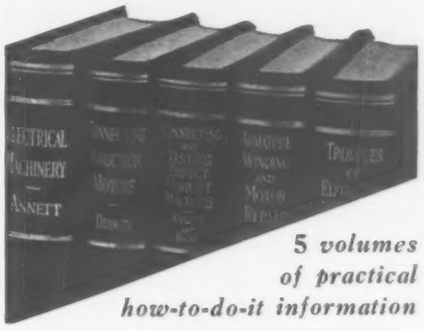
New 33,000-Volt Line

Potomac Edison Co. has started work to clear a right-of-way for a new 33,000-volt line which will complete a loop circuit from Cumberland around through the Frostburg, Keyser and Valley Districts. The 11.2 miles of line and terminal equipment will cost approximately $47,000 and will be completed in early fall. Because the line will cross a mountainous and wooded country some spans will be about 1,500 ft. and some around 1,000 ft. long.

Every phase of electrical maintenance and repair work covered in this NEW Library



5 volumes of practical how-to-do-it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

Electrical Maintenance and Repair Library

2042 pages, 1721 illustrations and diagrams

These books show you how to

—install all types of motor and generator units;
—locate breaks in armature windings and do a workmanlike job of rewinding;
—know just what is wrong with an electrical machine and take charge of installation and maintenance work;
—make accurate tests of switchboards and apparatus and correctly balance the power with the load;
—handle every sort of wiring job;
—show competence, whether it be in the use of a Stillson wrench or a Wheatstone bridge.

New trouble-shooting book

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a handy book full of helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

10 days' examination

Easy monthly payments

We want you to examine this Library for 10 days. If you don't want the books at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly payments then, and in a short time the books are yours, right while you have been using them. Send the coupon today.

EXAMINATION COUPON

McGraw-Hill Book Co., Inc.
330 W. 42nd St., New York, N. Y.

Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you $1.00 in 10 days, and $2.00 a month until $15.00 has been paid. Otherwise I will return the books postpaid.

Signature .....
Address .....
City and State .....
Firm or Employer .....
Position .....W. 9-7-40
(Books sent on approval in U. S. and Canada only.)

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word, minimum charge $2.00.

(See ¶ on box Numbers.)

Positions Wanted (full or part-time salaried employment only), ½ the above rates.

Proposals, 50 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞ inch vertically on one column, 3 columns—30 inches —to a page. E.W.

NEW ADVERTISEMENTS received by 10 A. M. September 16th will appear in the September 21st issue subject to limitations of space available

OFFICIAL PROPOSALS

Bids: September 24 (68)

Power Substations

GRAND RIVER DAM AUTHORITY
Grand River Project—Pensacola Dam
CONTRACT 13-D—
RIVERBANK SUBSTATION EQUIPMENT
1940

Sealed bids will be opened by the Board of Directors of the Grand River Dam Authority in Vinita, Oklahoma, on the 24th day of September, 1940, at 10:00 o'clock A.M. for

Contract 13-D—the furnishing f.o.b. cars Riverbank Generating Station, Byllesby, Oklahoma, on the Frisco Railroad of

Section 1. One (1) 16,500-kva oil-immersed, self-cooling power transformer; high voltage, 110,000 volts; low voltage, 66,000 volts;

Section 2. One (1) 69,000-volt, 600-ampere, electrically-operated oil circuit breaker of 500,000-kva interrupting capacity.

Bids may be tenedered upon either or both sections of the work, and if both sections are bid, they may be bid jointly or separately.

Bids may be filed with the General Manager of the Authority at his office in the City Hall, Vinita, Oklahoma, up to 10:00 o'clock A.M. of said day, at which time they will be opened and publicly read at a meeting of the Board of Directors. Any bid received after the closing time (10:00 o'clock A.M.) will be returned unopened.

Specifications, Form of Contract and Bond, Requirements for Bidding and Proposal Form are on file and can be seen at the Office of the General Manager of the Authority, City Hall, Vinita, Oklahoma, and they can be obtained from the Office of Holway and Neuffer, Engineers, 302 East 18th Street, Tulsa, Oklahoma, or Holway and Neuffer, Engineers, Vinita, Oklahoma, on deposit of $10.00 of which amount $5.00 will be refunded upon return of plans and specifications in good condition within ten days after the award of the contract. No refund will be made after that date. The total amount of the deposit will be refunded to all bidders. All checks for these deposits shall be made out to Holway and Neuffer.

Each proposal must be accompanied by a certified or cashier's check on any solvent bank or trust company, payable without reserve to the Grand River Dam Authority, in an amount not less than five per cent (5%) of the total amount of the bid. If bids are held more than ten days any bidder may substitute a satisfactory Bidder's Bond for his check in the same amount, and thereupon his check will be returned to him. Checks or bid bonds of the three low bidders will be retained until approval of contract and execution of satisfactory bond by the successful bidder, or until other disposition of the bids is made.

The bond required will be a performance bond for the faithful performance of the work in the full amount of the contract.

All bids must be made on the proposal forms furnished by the Authority and must be in accordance with the "Requirements for Bidding and Instructions to Bidders."

No bid may be withdrawn for at least sixty (60) days after the scheduled closing time for receipt of bids.

If awarded, the work under this contract will be awarded to the lowest responsible bidder on each section or on the lowest combination of sections.

All work herein advertised is to be paid for by voucher upon claim approved by the Engineers.

The Authority may request every bidder, before his bid is considered for award, to file a statement of facts as to his previous experience in performing similar work of comparable magnitude, of his business and technical organization, and financial resources and plant available and to be used in performing the contemplated work. Each bidder must have such information, together with a recent financial statement, available at Vinita, Oklahoma, the day on which bids are to be received.

The Board of Directors reserves the right to reject any or all bids and to waive any informality in any bid.

Dated this 27th day of August, 1940.

GRAND RIVER DAM AUTHORITY
By: Ray McNaughton
Chairman, Board of Directors

Bids: September 24 (69)

Substations

GRAND RIVER DAM AUTHORITY
GRAND RIVER PROJECT—
PENSACOLA DAM
CONTRACT 13-C—69-KV SUBSTATIONS
1940

Sealed bids will be opened by the Board of Directors of the Grand River Dam Authority in Vinita, Oklahoma, on the 24th day of September, 1940, at 10:00 o'clock A.M. for

Contract 13-C—the building of two complete 69-kv sub-stations, one at Collinsville and one at Chelsea, Oklahoma, and the furnishing and installation of certain equipment and the doing of certain work at the switchyard and power house at the Pensacola Dam on the Grand River in Northeastern Oklahoma.

Bids may be filed with the General Manager of the Authority at his office in the City Hall, Vinita, Oklahoma, up to 10:00 A.M. of said day, at which time they will be opened and publicly read at a meeting of the Board of Directors. Any bid received after the closing time (10:00 o'clock A.M.) will be returned unopened.

Plans, Specifications, Form of Contract and Bond, Requirements for Bidding, Proposal Form, and Construction Terms and Conditions are on file and can be seen at the Office of the General Manager of the Authority, City Hall, Vinitafi Oklahoma, and they can be obtained from the Office of Holway and Neuffer, Engineers, 302 East 18th Street, Tulsa, Oklahoma, or Holway and Neuffer, Engineers, Vinita, Oklahoma, on deposit of $20.00 of which amount $10.00 will be refunded upon return of plans and specifications in good condition within ten days after the award of the contract. No refund will be made after that date. The total amount of the deposit will be refunded to all bidders. All checks for these deposits shall be made out to Holway and Neuffer.

Each proposal must be accompanied by a certified or cashier's check on any solvent bank or trust company, payable without reserve to the Grand River Dam Authority, in an amount not less than five per cent (5%) of the total amount of the bid. If bids are held more than ten days any bidder may substitute a satisfactory Bidder's Bond for his check in the same amount, and thereupon his check will be returned to him. Checks or bid bonds of the three low bidders will be retained until approval or contract and execution of satisfactory bond by the successful bidder, or until other disposition fo the bids is made.

The bonds required will be a performance bond for the faithful performance of the work and a statutory bond for the protection of laborers and materialmen, both in the full amount of the contract.

All bids must be made on the proposal forms furnished by the Authority and must be in accordance with the "Requirements for Bidding and Instructoins to Bidders."

No bid may be withdrawn for at least sixty (60) days after the scheduled closing time for receipt of bids.

If awarded, the whole work under this contract will be awarded as one contract to the lowest responsible bidder.

All work herein advertised is to be paid for by voucher on estimates furnished by the Engineers.

Attention of the bidders is called to the Wage Scale as determined by the Authority and appearing in the "Construction Terms and Conditions."

The Authority will request every bidder, before his bid is considered for award, to file a statement of facts as to his previous experience in performing similar work of comparable magnitude, of his business and technical organization, and financial resources and plant available and to be used in performing the contemplated work. Each bidder must have such information, together with a recent financial statement, available at Vinita, Oklahoma, the day on which bids are to be received.

The Board of Directors reserves the right to reject any or all bids and to waive any informality in any bid.

Dated this 27th day of August, 1940.

GRAND RIVER DAM AUTHORITY
By: Ray McNaughton
Chairman, Board of Directors

POSITIONS VACANT

CHIEF OPERATOR WANTED for hydro-electric plant about to be completed. Must have at least 10 years experience as independent operator of hydro plant, operating under medium head and having units with penstocks and spiral cases. Give full information and minimum salary. P-790, Electrical World, 330 W. 42nd St., New York, N. Y.

DRAFTSMEN ELECTRICAL. Experienced in design and layout of substation and power plant electrical equipment. Location, middle west. State age, experience, qualifications, and salary desired. Write P-793, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

METER MAN by Utility company located in the South. Must be capable of handling Polyphase Testing and Meter Laboratory precision work. Give age—education—experience and salary expected. P-795, Electrical World, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000. This thoroughly organized advertising service of 30 years' recognized standing and reputation carries on preliminary negotiations for positions of the calibre indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R. W. Bixby, Inc., 262 Delward Bldg., Buffalo, N. Y.

EXECUTIVES AND TECHNICAL MEN. Contact employers for positions through our confidential and effective methods. We negotiate preliminary overtures. Established 24 years. Inquiries invited. H. H. Harrison, Director, The National Business Bourse, 20 West Jackson Blvd., Chicago.

(Continued on the opposite page)